

New Zealand Dairy Outlook 2019



A Sustainable
Dairying Future





People have never cared more, or known less about how their food is produced, this report aims to provide a window into New Zealand's incredible dairy products.

We outline the challenge but also the wonderful opportunity the New Zealand Dairy industry has as it aims to be one of the most **sustainable dairy producers in the world.**

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What's next for dairy?



Foreword

Dairy farming and export returns have long been a cornerstone of the New Zealand economy. Beyond our farmers, much of our country, many of our communities and businesses like NZX have “Dairy in our DNA”.

Around the world New Zealand has been admired for our pasture-based production, our on-farm innovation and manufacturing processes. New Zealand's dairy ingredients have set the benchmark for quality and our brands have been the choice of the most discerning consumers.

Our NZX Dairy Derivatives Market reflects this leadership position – the fastest-growing globally, and we see this evolving over time to a mature market at multiples of the physical trade, with a full suite of risk management tools that support the success of the New Zealand dairy sector.

The insights, data and case studies in this 2019 Dairy Outlook report reflect our commitment to strong coverage of the New Zealand dairy sector, backed by the deep expertise of our team and observations from key players in the local market.

As dairy consumers look more closely at the origin – and production – of their foods, this report highlights an opportunity for New Zealand dairy to be more consumer-led with a focus on truly sustainable production of the highest-quality natural products. This is already emerging as a requirement for the industry's domestic licence to operate, and will position New Zealand's dairy sector well for the accelerating demand shift that will come from mindful consumption.

In a fast-evolving global food market, this is about maintaining and building on New Zealand's reputation for the very best and as a trusted source of foods – matching our natural products with consumers who share our values and offer a premium return.

Drawing from the Māori world view of “kaitiakitanga” (or guardianship), New Zealand dairy producers are increasingly demonstrating an inter-generational view of this opportunity and a determination to grow further strength, resilience and a bright future for their industry.



Mark Peterson
Chief Executive
NZX Ltd



LEARNING FROM THE PAST

Globally, food systems are being put under the microscope by consumers, veganism popularity is on the rise and we see new definitions for consumption popping up like, flexitarian (those who make mindful food decisions).

Report after report is being released claiming the evils of animal proteins for both your health and the planet and you can't help but think how overwhelming it must be for consumers, producers and food processors to work out how to produce, what to make or what to consume. In our world of crowded information highways it can be hard at times to pick the fact from fiction and made even harder when the definition of either seems to be looser than it has ever been. More and more we are seeing consumers buying the process in which the product was made rather than the product itself, so it is essential that those selling food have deep transparency in food production and are listening to signals of change from the consumer.

New Zealand is an export led economy most of the food we produce we export and 40% of total food exports comes from Dairy product. Dairy is a significant economic contributor to New Zealand's communities and has in the last 5 years shifted focus to being a strong contributor to environmental wellbeing. There is a lot more work to be done on environmental impact but the industry has a strong commitment to ensure that they don't just sustain the environment but work hard to regenerate it.



TO SECURE THE

FUTURE

The New Zealand Dairy industry has 2 distinct consumer groups to consider first is the global consumer, meeting their needs ensures we maintain our right to market, secondly is the domestic consumer that provide the license or opportunity to continue to produce dairy products. Both sets of consumers have a complex matrix of needs that must be met.

As the focus turns to human and planetary wellness, there is a growing demand for nutritionally dense foods that are good for the planet and are produced with great transparency.

This creates some challenges but also an arena of wonderful opportunities for the New Zealand dairy industry. New Zealand dairy herds have pasture and green leafy forage as over 80% of their diets. The majority of herd's free range as our temperate climate allows for grass growth in most of the country right across all four seasons. This method of production isn't new to New Zealand however for a while our focus shifted from producing volume rather than focusing on quality. The industry imported more feed, bought in genetics that were not as well suited to New Zealand terrain and we wanted to compete on volume with offshore producers.

This all might sound logical but for a small country with only 13.9 million hectares of potential farming land and only a small portion of that suitable for dairying, volume isn't an option. Our future success relies on learning the good and bad from the past and ensuring we use this knowledge strategically to grow a sustainable dairying future.

State of the nation

NEW ZEALAND DAIRY SNAPSHOT

FIG. 1

Macro National Numbers: New Zealand Milk Production

Source: DCANZ

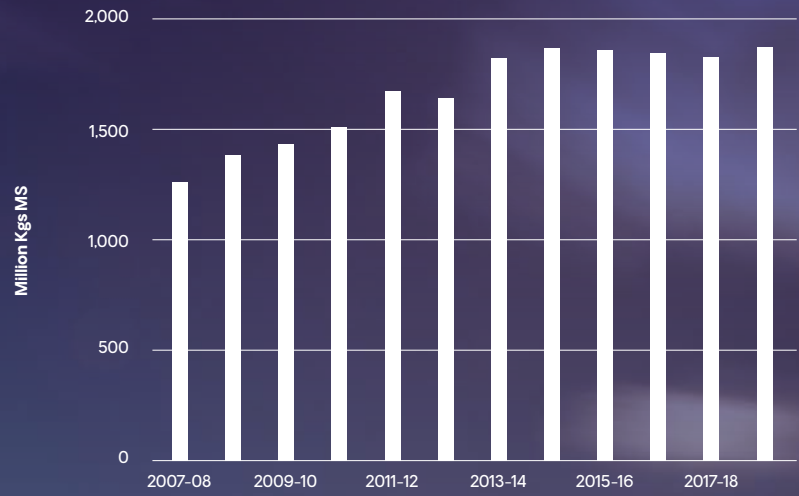


FIG. 2

Land use for dairying

Source: DairyNZ

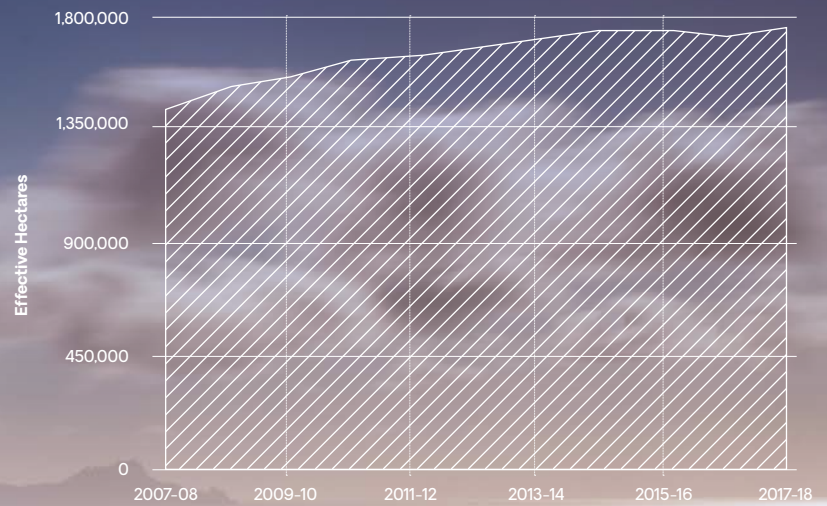


FIG. 3

Number of cows

Source: DairyNZ



State of the nation

FIG. 4

Milk Production (North & South Island New Zealand)

Source: DairyNZ

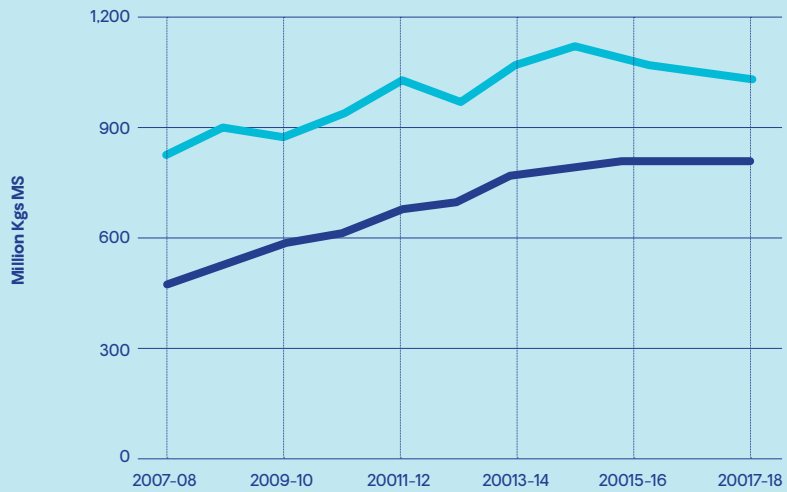


FIG. 5

Milk Price

Source: Fonterra and DairyNZ

Average milk price
between
2007-08 & 2017-18



6.13

Highest milk price
between
2007-08 & 2017-18



8.40

Lowest milk price
between
2007-08 and 2017-18



3.90

Average farm working expenses
between
2007-08 and 2017-18



3.95

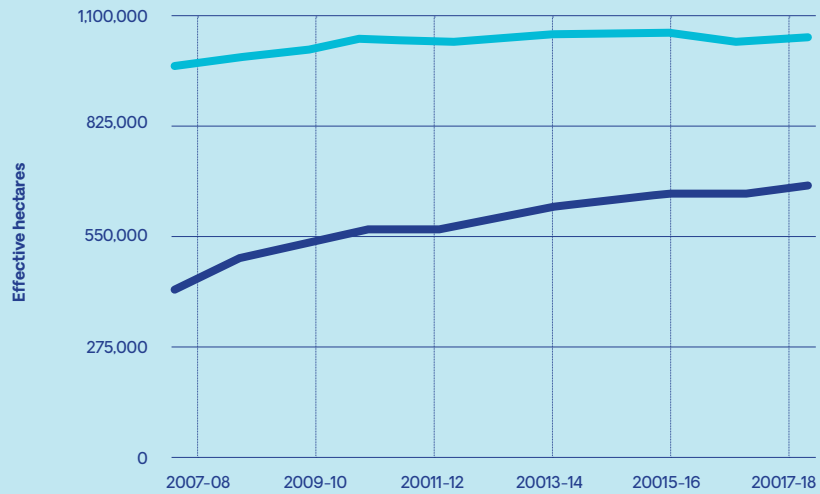
Fonterra milk price forecast
2019-20



6.25-7.25

FIG. 6
Land used for dairying
 (North & South Island
 New Zealand)

Source: DairyNZ



Dairy has been shifting from the North to the South Island, though the rate has slowed in more recent years.

Biosecurity

After discovering Mycoplasma Bovis New Zealand's Ministry for Primary Industry made a decision to eradicate the disease and remain committed to achieve this goal.

To support the financial loss of culling animals to farmers a Biosecurity Response Levy of 2.9 cents per kg of milk solids will apply from 1 September 2019 to 31 May 2020

July 2017
 Disease found in
 New Zealand

May 2018
 Decision to
 eradicate

As at 4 September 2019:



191

properties confirmed to have M.bovis, with 69 of them dairy



20

properties with Mycoplasma bovis that are pending or going through depopulation and cleaning and disinfection



112,503

animals culled

State of the nation

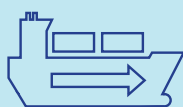
New Zealand dairy product exports

In 2018, New Zealand exported:



29%

of total exports went to China



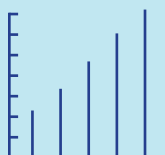
2,993,085

metric tonnes of dairy



47%

of total exports were whole milk powder



\$15.9BN

was the total value (NZD)

FIG. 7

Dairy product exports – volume and locations

	2018 Metric Tonnes	2008 Metric Tonnes	Growth	2008 Key destination	2018 Key destination
Whole milk powder	1,391,963	617,703	125%	Venezuela	→ CHINA
Skim milk powder	364,047	247,825	47%	Philippines	→ CHINA
Anhydrous milkfat	206,558	114,075	81%	United States	→ CHINA
Butter	271,901	226,123	20%	Iran	→ CHINA
Cheese	334,674	258,142	30%	Japan	Japan

FIG. 8

New Zealand WMP exports

Source: DairyNZ

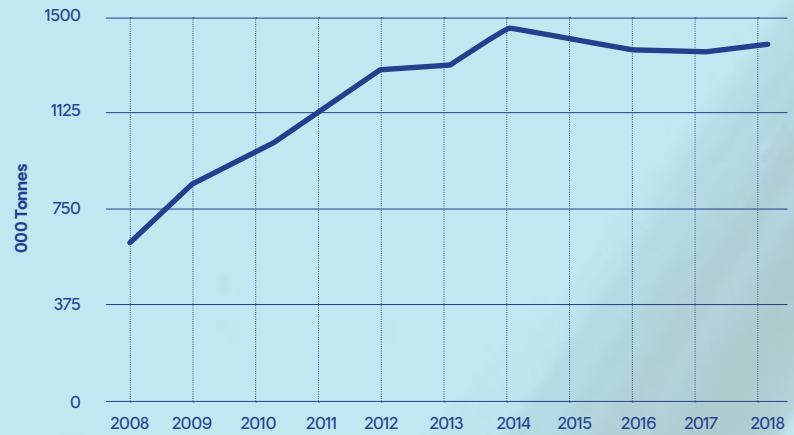
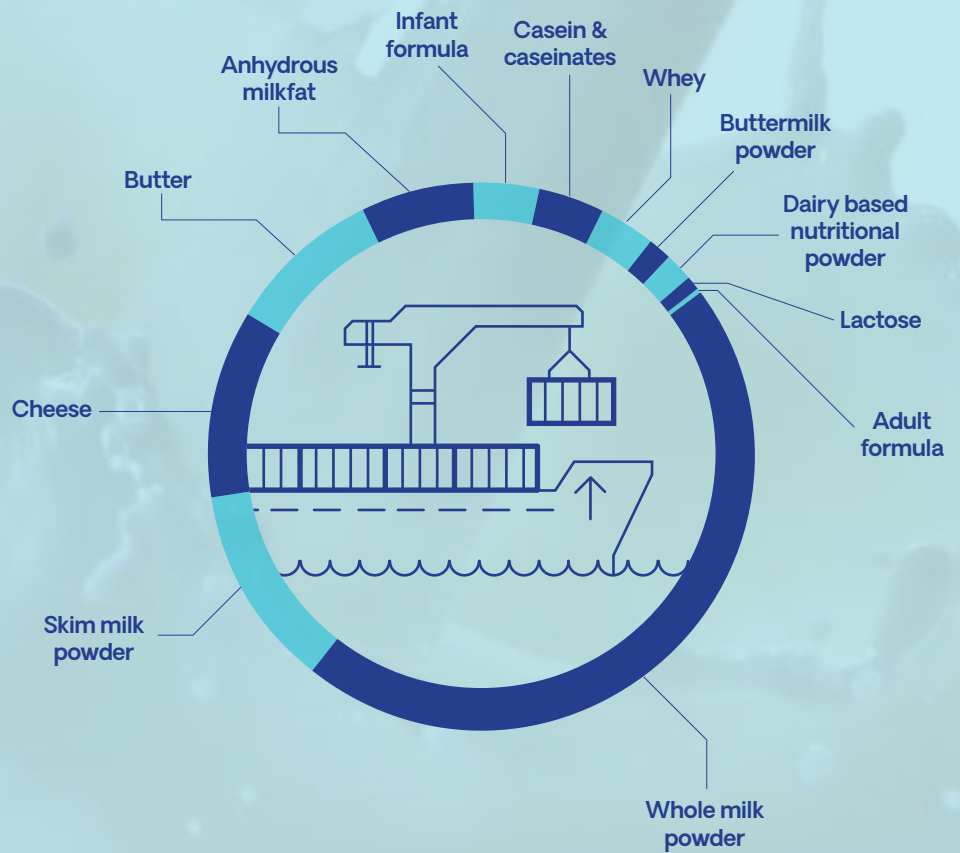


FIG. 9

New Zealand 2018 dairy exports by volume

Source: DairyNZ

Many of New Zealand's milk processors continue to strive towards value based product development rather than commodity based volume. Being a high quality ingredient is still a critical part of the future strategy.



NZX — OUR PEOPLE



Nick Morris

Head of Derivatives

Nick Morris leads the development of NZX's derivatives market, which includes global dairy commodity contracts such as whole and skim milk powder, and the recently launched NZ Milk Price futures and options. In addition, NZX operate equity derivatives including NZX20 futures and individual stock options. Nick's background is in foreign exchange markets having worked at Bank of New Zealand (BNZ) for four years in a variety of FX related roles. Prior to BNZ, Nick was at Medley Global Advisors as a Research Analyst. Nick also sits on the Global Dairy Trade Oversight board.

Contact Nick
T. +64 9 308 3703
E. nick.morris@nzx.com



Julia Jones

Head of Analytics
Co-author

Julia Jones strives to inspire confidence, new thinking and adaptability in the dairy industry. She spent almost 15 years in the rural banking sector before moving to KPMG in consulting and then to NZX.

Julia's previous role at KPMG focused on the future of dairy, including analysing emerging alternative protein trends and other potential global disruptors.

Contact Julia
M. +64 27 524 8901
E. julia.jones@nzx.com



Nick Garden

Manager, Derivatives & Data Insights
Co-author

Nick Garden joined the NZX in April 2018 to manage the development of the NZX Milk Price Futures and Options market. He focuses on participant education and supporting growth in the providers of price risk management and advisory services. Prior to joining the NZX Nick spent 7 years as General Manager of a farming business and 8 years in derivatives trading and business development roles in dairy and electricity for Fonterra, Trustpower and Centrica - British Gas. Nick is also in a governance role for a dry stock and forestry business.

Contact Nick
T. +64 9 375 9865
E. nick.garden@nzx.com



Saskia Ruscoe

Manager, Markets Development

Saskia Ruscoe manages the development of NZX's Secondary Markets, across equities, debt, ETFs and NZX Derivatives suite of dairy and equity futures and options. She focuses on the current participants relationships, participant pipeline and the development of the overall markets structures. Saskia joined NZX in 2015 as part of the NZX Graduate Programme and since then has worked across various parts of the market, including Surveillance, Operations and Market Data. She holds a Bachelor of Commerce with First-Class Honours from the University of Auckland.

Contact Saskia
T. +64 9 375 6006
E. saskia.ruscoen@nzx.com



Jessica Darrah

Markets Development Associate, Derivatives

Jessica joined NZX in January 2016. Her focus is on analysing and communicating market data as well as assisting in market development projects to support NZX's global network of dairy derivatives users. Prior to joining the derivatives team, Jessica worked within NZX's corporate communications and Data & Insight (formerly AgriHQ) dairy intelligence marketing teams.

Contact Jessica
T. +64 9 368 1374
E. jessica.darrah@nzx.com



Rob Gibson

Analyst, Dairy
Co-author

Prior to joining NZX, Rob was senior analyst at Beef + Lamb New Zealand where he was responsible for analysing the impact of changes on-farm, and reporting on the economic and production impacts of these changes on the wider industry and global markets. With Rob's agri-economics background, and upbringing on large-scale farming properties, he has a strong on-farm understanding of New Zealand's dairy industry. His key focus being on New Zealand's domestic dairy market and the areas that impact production.

Contact Rob
T. +64 4 471 4395
E. rob.gibson@nzx.com



Amy Castleton

Senior Analyst, Dairy
Co-author

Prior to joining NZX, Amy was a policy analyst at the Ministry of Business, Innovation and Employment, working in trade, regulatory and regional policy. She primarily focused on trade remedies. With Amy's trade background and the knowledge she has developed of the dairy market within New Zealand and internationally, she is able to take a strong global perspective and insight to deliver expert commentary and analysis.

Contact Amy
M. +64 27 213 2384
E. amy.castleton@nzx.com

1.0

LOOKING FORWARD



**LOOKING
AHEAD THE
NEW ZEALAND
DAIRY SECTOR
IS STEPPING
UP TO FURTHER
IMPROVE ITS
ENVIRONMENTAL
FOOTPRINT AS
IT RELATES
TO CLEANER
WATERWAYS AND
GREEN HOUSE
GASES.**

2%

estimated decrease
in cows each year

419

average herdsize
(avg. of previous
5 years)

Looking forward

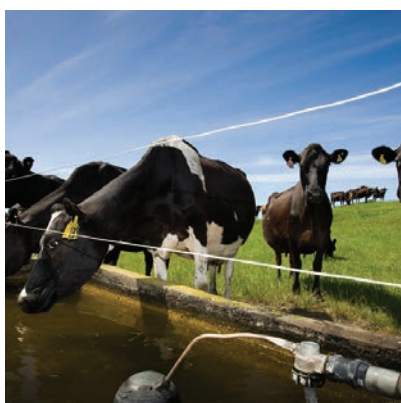
Forecasts



Milk production

Over the medium to long term, NZX is expecting a decline in New Zealand's milk production. While we are expecting a small increase in the 2019-20 season, we do not expect this to last, as farmers grapple with increased regulatory compliance and public policy issues, particularly to meet water quality, climate change and other new environmental standards.

We are anticipating a 0.7% increase in milk supplies for the 2019-20 season, largely due to a few more cows (0.3%) being retained on farm at the peak of the milking season.



Expectations of a good payout for a fourth season, along with reasonable weather, should encourage NZ's dairy farmers to produce a little more this season. NZX's Milk Production Predictor tool updates the current season's forecast each month, so this forecast will be updated as the 2019-20 season progresses.

The policy agenda is becoming more and more focused on environmental issues, particularly water quality. Dairy farmers have so far been subject to most of the blame for poor freshwater quality, and the dairy industry is expected to contribute significantly to resolving the issues. The increasing compliance that dairy farmers are facing – and the uncertainty over exactly what this will look like in future – means that we expect milk production to start being scaled back. Farmers are likely to stock fewer cows, and may reduce their land area. There will also be those who choose to exit the industry. Cow productivity is expected to improve slightly, but this is unlikely to be enough to outweigh fewer cows and a smaller area of land used for dairy farming.

On average, we expect milk production to ease 1.7% each year out to the 2024-25 season. The decline could be more dramatic, depending on exactly what regulations dairy farmers have to comply with in the future.

FIG. 10

Cow numbers

Source: DairyNZ and NZX

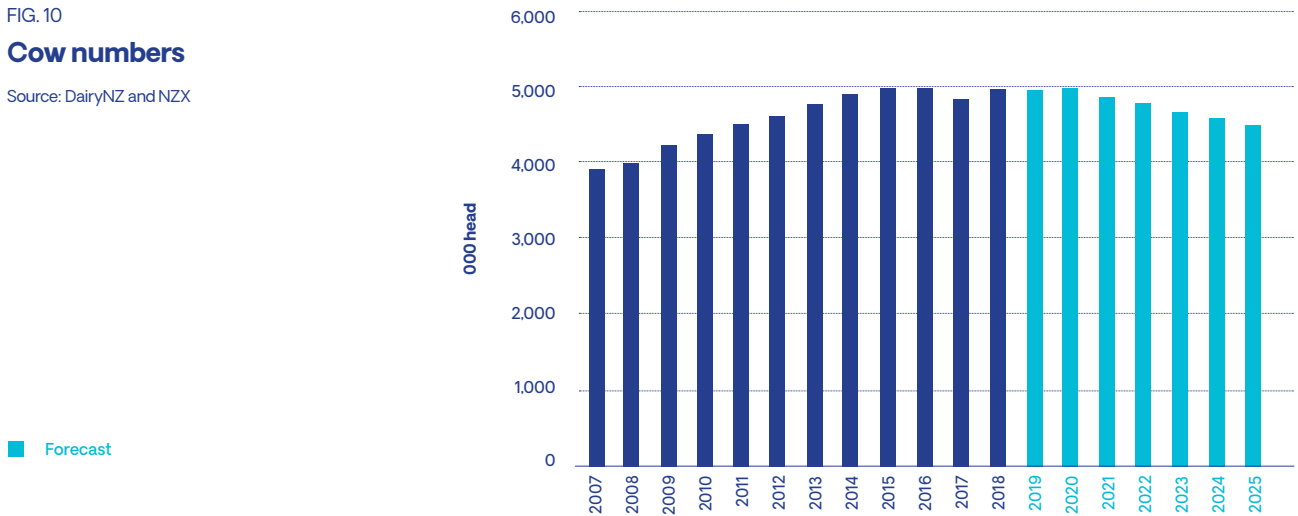


FIG. 11

Cow productivity

Source: DairyNZ and NZX

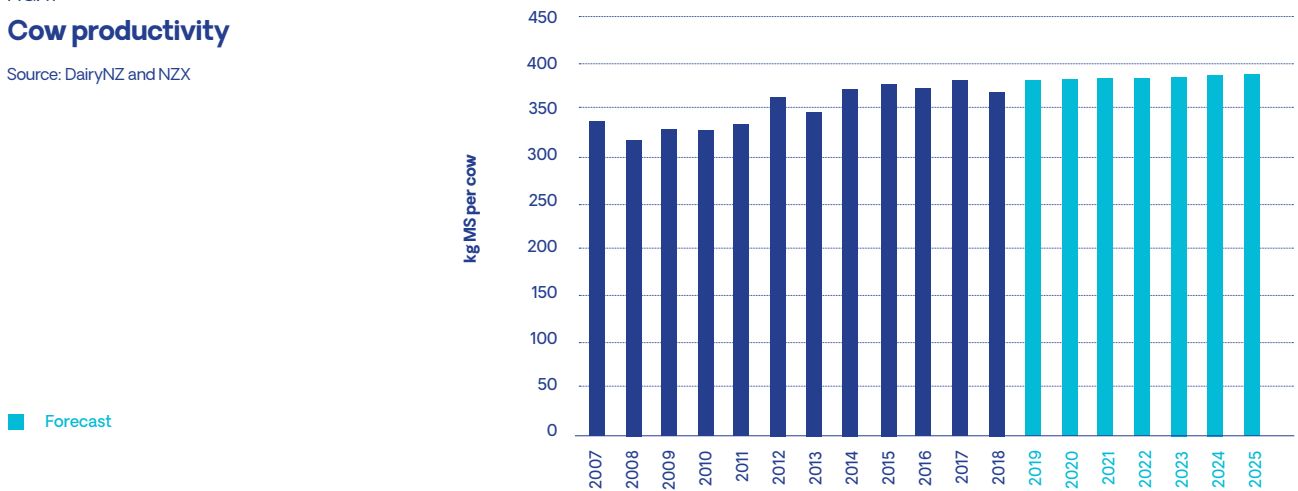
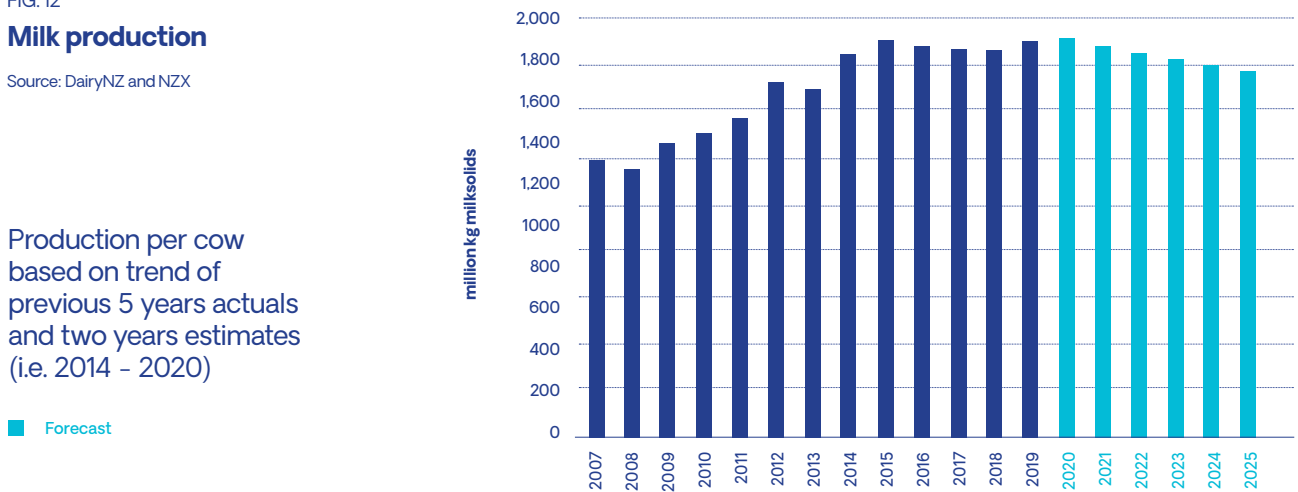


FIG. 12

Milk production

Source: DairyNZ and NZX

Production per cow based on trend of previous 5 years actuals and two years estimates (i.e. 2014 - 2020)





Forecasts



FIG. 13

New Zealand dairy exports volume

Source: Statistics NZ, NZX

- WMP
- Infant formula
- SMP, Butter, AMF
- Cheese
- Other
- * Forecast

Other includes buttermilk powder, casein and caseinates, whey and milk protein concentrate.

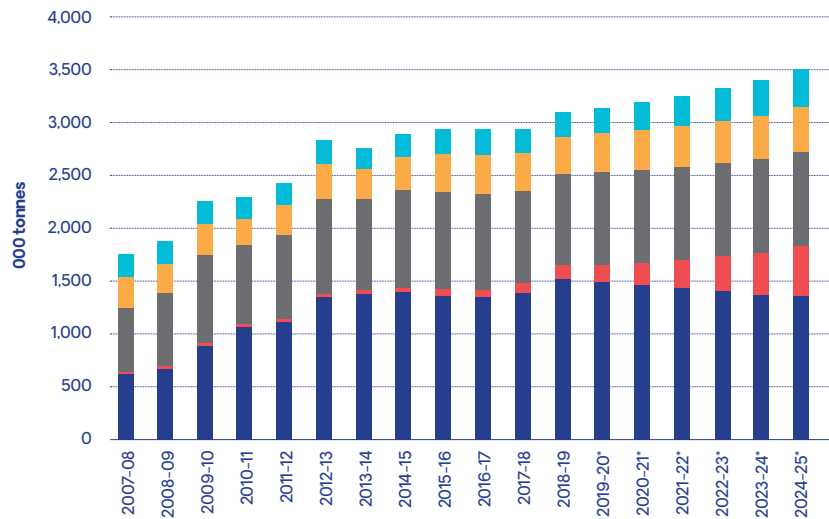


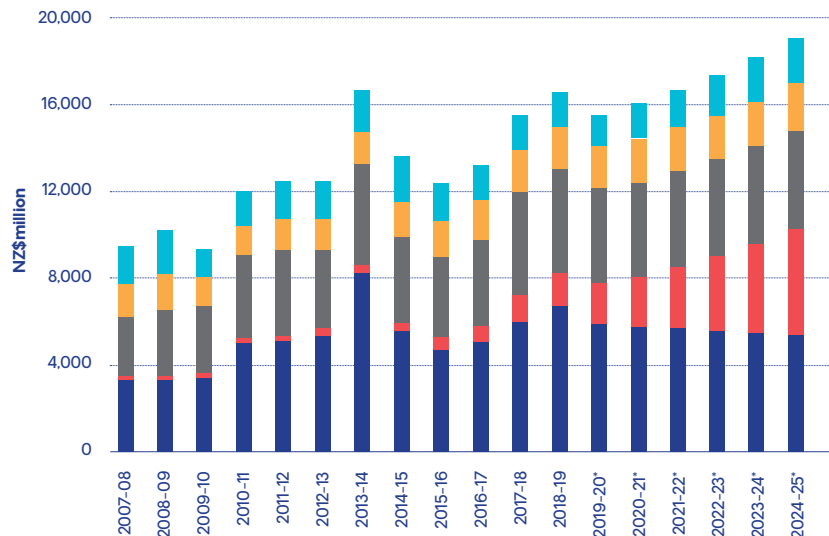
FIG. 14

New Zealand dairy exports value

Source: Statistics NZ, NZX

- WMP
- Infant formula
- SMP, Butter, AMF
- Cheese
- Other
- * Forecast

Other includes buttermilk powder, casein and caseinates, whey and milk protein concentrate.





Exports and value add

NZ is well-known as a commodity producer, and has particularly carved out space in the supply of whole milk powder (WMP). On average, the volume of WMP NZ has exported over the past five seasons (since 2014-15) has grown 2% each season, though the value of this commodity has fallen. There has, however, been greater growth in 'value add' commodities, which is perhaps best illustrated by infant formula. Infant formula export volumes have grown 28% on average over the past five seasons, while the value of infant formula exports has grown 34% on average for each of the past five seasons. Similarly, the volume of whey and milk protein concentrate exports has grown 23% on average over the past five seasons, though the value of these products has increased only 4% on average over the same time period.

This perhaps indicates that whey and its derivatives are becoming more commoditised.

Looking ahead, we expect more of a shift towards value-add type products and away from commodities.

We expect WMP export volumes to fall over the coming seasons, by about 2% each season. This will equate to a fall of approximately NZ\$500 million in the value of WMP exports between 2019-20 and 2024-25. However, this will be more than made up by milk shifting into higher value products. We anticipate growth of approximately \$4 billion in the value of other dairy exports - which does include some commodity products such as skim milk powder. The majority of this will be made up by infant formula, with growth in the region of NZ\$3 billion expected between 2019-20 and 2024-25.

WE ANTICIPATE GROWTH OF APPROXIMATELY \$4 BILLION IN THE VALUE OF OTHER DAIRY EXPORTS (WHICH DOES INCLUDE SOME COMMODITY PRODUCTS SUCH AS SKIM MILK POWDER). THE MAJORITY OF THIS WILL BE MADE UP BY INFANT FORMULA, IN THE REALM OF GROWTH OF NZ\$3 BILLION BETWEEN 2019-20 AND 2024-25.



Forecasts

FIG. 15

Total effective hectares Land used for dairy production

■ Forecast

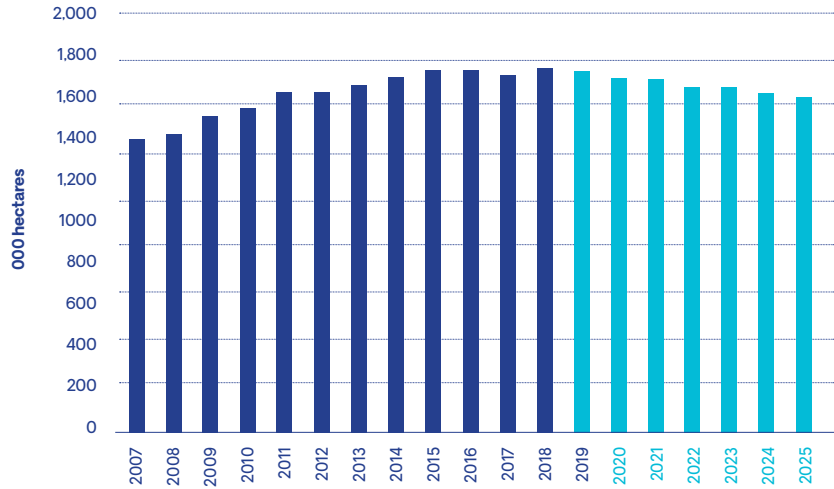


FIG. 16

National average pasture growth index

■ 10th/90th Percentile
■ National average PGI

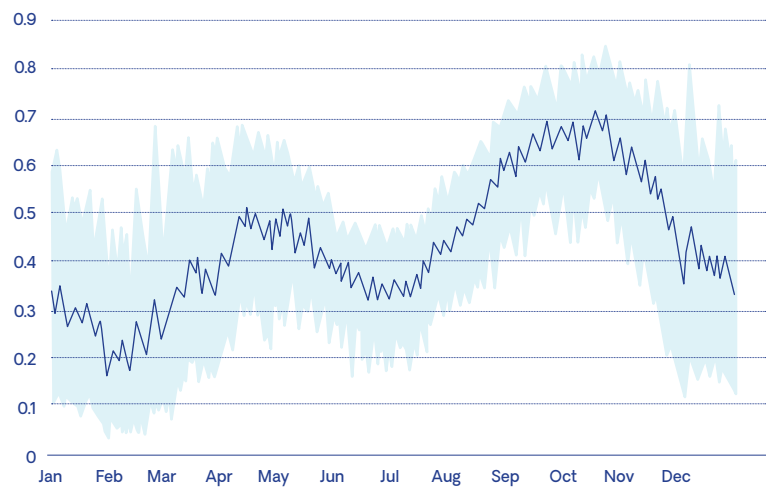
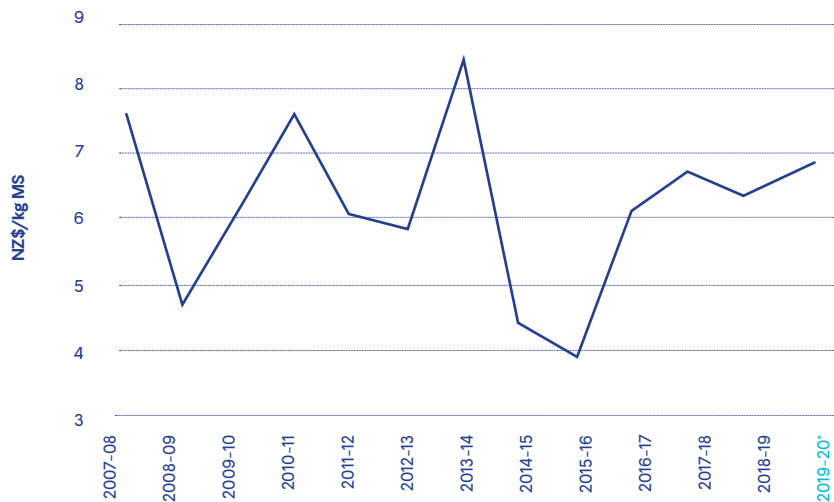


FIG. 17

Fonterra milk price

Source: Fonterra, NZX

* = Forecast





Payout

Fonterra's milk price has steadied in recent seasons. For each of the 2016-17, 2017-18, and 2018-19 seasons, Fonterra paid a milk price over \$6/kgMS.

Prior to this – between the 2007-08 season and the 2015-16 season – Fonterra's final milk price has averaged \$6.07/kgMS. This does, however, include a low of \$3.90/kgMS paid in the 2015-16 season, and a high of \$8.40/kgMS paid in the 2013-14 season.

NZ milk prices are subject to the highs and lows of the global dairy commodity market. Because NZ exports so much of its dairy production and is one of the largest contributors to globally traded supply, it is international prices that influence what NZ dairy farmers receive in the hand, rather than domestic prices. The \$8.40/kgMS season was the period when Chinese demand for NZ dairy skyrocketed. On the other hand, the \$3.90/kgMS season was a result of too much milk being available globally, after European milk production quotas were removed.

In more recent seasons, the global dairy commodity market has steadied to a degree, and prices have not fluctuated as much. Thus Fonterra has had a steadier payout history. This looks set to continue, bar any unforeseen shocks to the market.

The co-operative has forecast a payout of between \$6.25 and \$7.25 for the 2019-20 season. NZX concurs with this forecast, with our own forecasts via our Milk Price Calculator so far being well within this range. At this stage, NZX is forecasting a \$7.00/kgMS payout for the 2019-20 season, based on how prices have performed at Global Dairy Trade so far this season, and the outlook for prices on the NZX Dairy Derivatives market.

Commodity prices are expected to stay relatively flat into the 2020-21 season. Flat milk supply from most regions should support commodity prices through the next 12-to-18 months. Exchange rate forecasts are also for a weaker NZ dollar due to the trade war between the US and China – this is supportive for NZ milk prices. NZX is therefore forecasting a slightly higher milk price next season.

Further out, milk price forecasts are based on long-run averages for each of the inputs into NZ milk prices, along with exchange rate forecasts. The NZX forecast for the 2021-22 season is \$6.86/kgMS.

Pasture Growth Index

New Zealand largely runs a pasture-based dairy system, so milk supply growth is largely dependent on pasture conditions at any one time. NZX's Pasture Growth Index tool measures the relevant conditions – light, temperature and moisture – and illustrates the growth potential of pasture. Pasture-growing conditions are typically at their best in October – the peak of NZ's dairy season – and their lowest in February. This does vary slightly from region to region. Fig. 15 illustrates New Zealand's typical pasture growth conditions since 1995, along with the range over that time period. We would expect pasture growth conditions to largely follow historical averages, barring any extreme weather events.

Looking forward

Deep dive into on-farm profitability

Dairy Farming New Zealand

New Zealand dairy herd numbers were 11,590 for 2017-18 (year end 30 May 2018), which covered 1.76 million hectares (LIC). This makes up around 15% of pastoral land in agricultural and horticultural in New Zealand (SNZ).

At an enterprise level, more than 90% of farm revenue is generated from the sale of milk, with 6% generated from livestock sales. Meanwhile the most significant areas of cost are; net feed made, purchased and cropped; wages; and fertiliser (including Nitrogen) which make up around 50% of farm working expenditure (see Fig. 18).

The business model for the New Zealand dairy farm over the next 10 years is being challenged. Not only do farms have to deal with their exposure to milk price volatility, but there are further direct costs on the horizon that will challenge farm businesses. These include compliance costs to maintain clean waterways and accountability for greenhouse gases. However, before we explore the impact of those costs, it is important to celebrate some of the successes within the industry.

Sector Wins

Through improvements in farm management practices and a focus on factors within control of farm businesses, New Zealand dairy farmers have had a great deal of success. The number of milk solids produced per hectare has lifted over the last 10 years (2008/09 to 2017/18) from 921kgMS/ha to 1048kgMS/ha (+147kgMS/ha). Meanwhile per cow milk production has also lifted from 323kgMS/cow to 368kgMS/cow (+45kgMS) (LIC). This is a reflection of genetic improvements over time, and the ability of farmers to adopt good management practices to best express those improvements.

Current risks

Current risks include milk price risk, and debt.

Milk price risk is highlighted in Fig. 19 which shows the impact of swings in milk price on cash revenue, and the EBIT. Total cash revenue is largely impacted by swings in the milk price, but farm businesses have moderated the impact of this by increasing their milk production over time.

A steady increase in the average milk price has led to total revenue lifting over time. However, this increased revenue has been moderated by the cost of doing business which is reflected in farm cash working expenses lifting 55% over the last 10 years.

FIG. 18

New Zealand Dairy Farm – Owner Operator
Non-inflation adjusted
(Year end 31 May)

Source: NZX, DairyNZ Economic Survey

- Wages
- Net feed made, purchased, cropped
- Fertiliser (incl. Nitrogen)
- Total Farm Working expenses (TFWE)

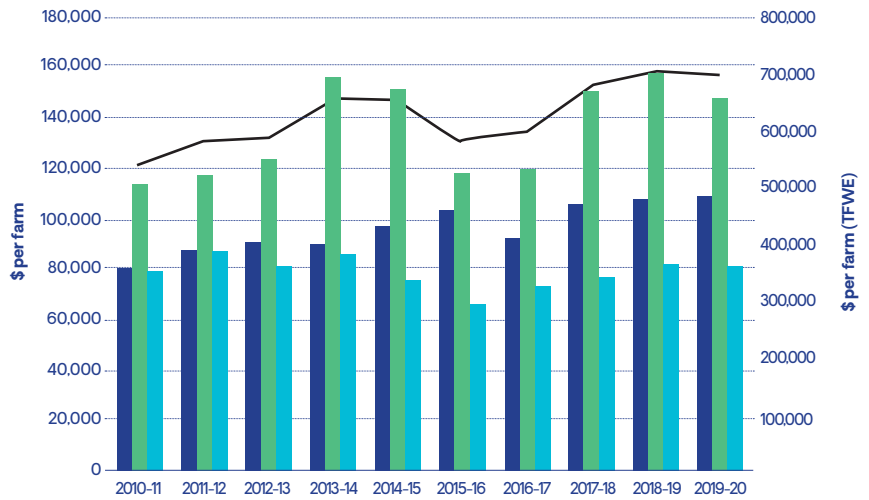


FIG. 19

New Zealand Dairy farm – Owner Operator
Non-inflation adjusted
(Year end 31 May)

Source: NZX, DairyNZ Economic Survey

- Total cash revenue
- Farm cash working expenses
- EBIT (excl non cash adjustments)

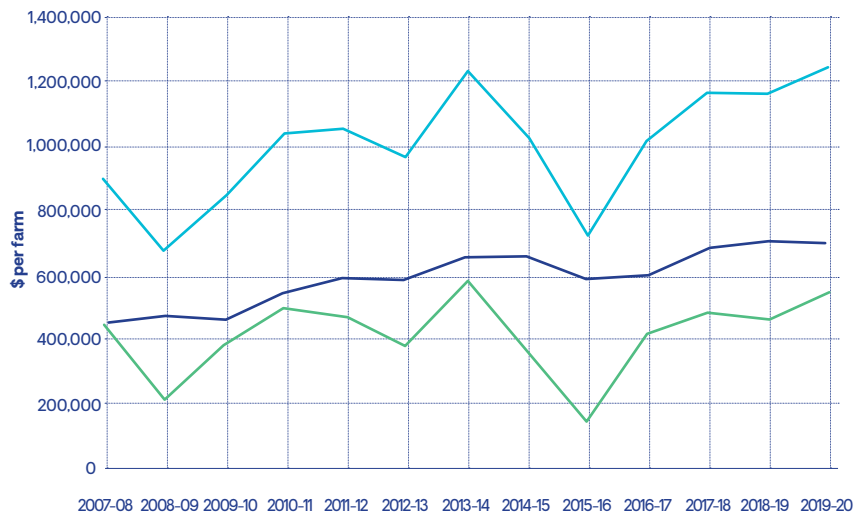
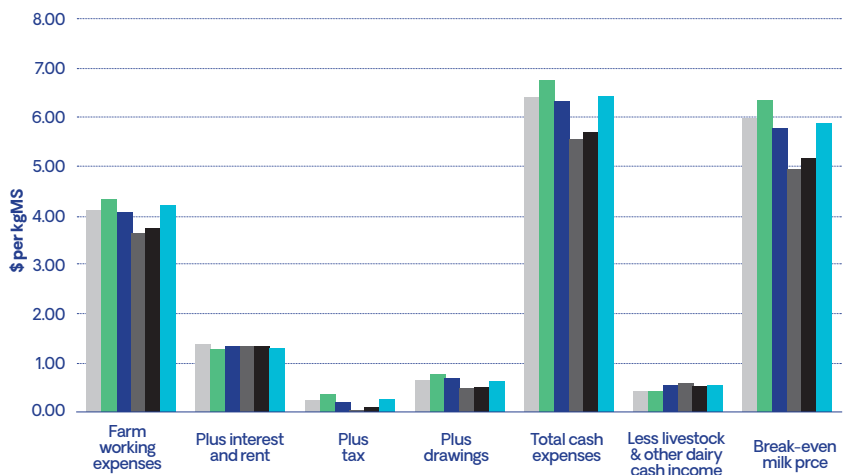


FIG. 20

New Zealand Dairy farm – Owner Operator
Break-even milk price
Non-inflation adjusted
(Year end 31 May)

Source: NZX, DairyNZ Economic Survey

- 2012-13
- 2013-14
- 2014-15
- 2015-16
- 2016-17
- 2017-18



Looking forward



Debt levels also pose a major risk to farm businesses, and this is not captured in the graph above. Term liabilities per farm have increased from \$2.4m to \$4.1m in the last 10 years, up 69% or \$1.7 million (DairyNZ). At a sector level, total liabilities sum to \$41,600 million (Reserve Bank of New Zealand S34 series), and show no signs of shrinking.

This leverage has been highlighted as a business risk by the Reserve Bank of New Zealand which in turn has flowed through to increasing capital requirements of those banks operating in New Zealand. Highly leveraged businesses can be fortunate for the low interest rate environment, and the subsequent impact on debt servicing which is minimal. As a guide, interest and rent currently making up around 20% or \$1.30/kgMS of the breakeven milk price of \$5.88/kgMS for 2017-18 (DairyNZ).

Future risks

The New Zealand dairy sector is working towards reducing its impact on waterways, and accounting for greenhouse gases. Both of these activities will increase the cost of doing business for farmers, and both can be assessed against the breakeven milk price.

The breakeven milk price for the average dairy farmer is \$5.88/kgMS (DairyNZ). This is made up of farm working expenses (66%), interest and rent (20%), tax (4%) and drawings (10%).

To reduce the impact of dairy farms on waterways, businesses will need to continue investing in infrastructure which includes planting waterway edges, and fencing which is a direct cost. There is also an indirect cost, which is reduced and more targeted use of nitrogen fertiliser around these waterways which impacts on pasture growth and subsequent milk production. Infrastructure costs are likely to be funded through debt, and increase cost of interest which (with rent) makes up around 20% of the breakeven milk price. (See Fig. 20).

Accounting for greenhouse gas is an on-going cost. Methane makes up around 71% of greenhouse gas for agriculture, with the average dairy cow producing just over 2 tonnes of CO₂ equivalent gas per year from methane emissions. If we overlay a price of \$25/CO₂ equivalent ton, and scale this up to the average dairy farm which carries around 433 cows at peak milk, the average annual cost is \$21,650 per farm. In isolation of carbon sinks and offsets, this would be an ongoing cost to the farming business, albeit which is only accounting for methane produced from dairy cows at peak milk.

We estimate that the lift in interest and working expenditure would increase the break-even milk price of \$5.90/kgMS above \$6.00/kgMS. This is significant considering that we are currently in a reasonable year for milk prices, which has industry estimates ranging from \$6.25/kgMS to over \$7.00/kgMS for 2019-20.



Conclusion

The New Zealand dairy industry is certainly past its growth phase. Although we have seen a lot of productivity gains in the sector over time, high debt levels put the sector at risk of any increases in interest rates. Meanwhile, one of the most front of mind issues for the New Zealand dairy sector is uncertainty over how environmental policy is going to impact the cost of doing business, but also how it will affect the value of land, particularly with caps on the horizon regarding what you can and can't do with this land.

Over the next 10 years, our outlook for the New Zealand dairy sector is no longer one of growth, but one of stability as businesses focus their energies on aligning their businesses with environmental targets set by government. Despite the discussed headwinds, individual businesses require an investment of nearly \$6 million just for land and buildings, so is not an enterprise you can readily exit out of, and is not an industry that is going to fade away anytime soon.

Farmer case study



A New Zealand dairy farmers experience with hedging milk price

The purpose of this case study is to provoke New Zealand dairy farmers to think about the multitude of risks they face and to consider a way to reduce one – milk price volatility.

We were lucky enough to speak with Cantabrian dairy farmer Marv Pangborn, to understand his views on risk and what steps he has taken to manage milk price risk within his business.

Risk perception



How do you think about risk in your business?

I have been a NZ dairy farmer since 1987, coming from a family where it appears that the previous eight generations have been farmers as well. However, I started my working life as a rural banker. A family history in farming and surviving downturns both as a lender and as a farmer have made me become somewhat conservative in my sixth decade. But, like most New Zealand farmers who have built larger farming businesses from small beginnings, we took risks to grow the business. We now milk 1,200 cows and farm over 500 hectares – along with growth has come debt.

I have also spent the last 17 years as a lecturer in farm management at Lincoln University. Last year, as part of that role, I was asked to identify the risks to our business. The chart above outlines some of the areas that in my view may affect our success.

These perceived risks have been categorised into areas where we have no control (government interference and international politics), areas where we are able to have some effect on outcomes (environment and understanding consumer change) and areas where we have a fair level of control (people welfare on the farm, animal welfare, biosecurity, costs of inputs and income volatility).

I have always been a great fan of Doug Avery (Author of the Resilient Farmer), who says something like “concentrate on what you can control.” With this in mind, we watch the uncontrollable, do what we can with the areas where we have some control, but concentrate on the areas where we can influence outcomes.

Although I could discuss all these areas, a problem for dairy farmers since the demise of the Dairy Board has been milk price volatility. As the graph shows, milk prices have ranged from \$3.90 per kg of milksolids to \$8.40 per kg of milksolids during the period 2006/07 to 2018/19. Fortunately, since 2016-17 prices have been more stable (all over \$6 per kg milksolids), but many of us still have nightmares about the \$3.90 year. (See Fig. 21 next page)

Farmer case study

FIG. 21
Fonterra New Zealand Milk Price (Nominal)

Source: Fonterra

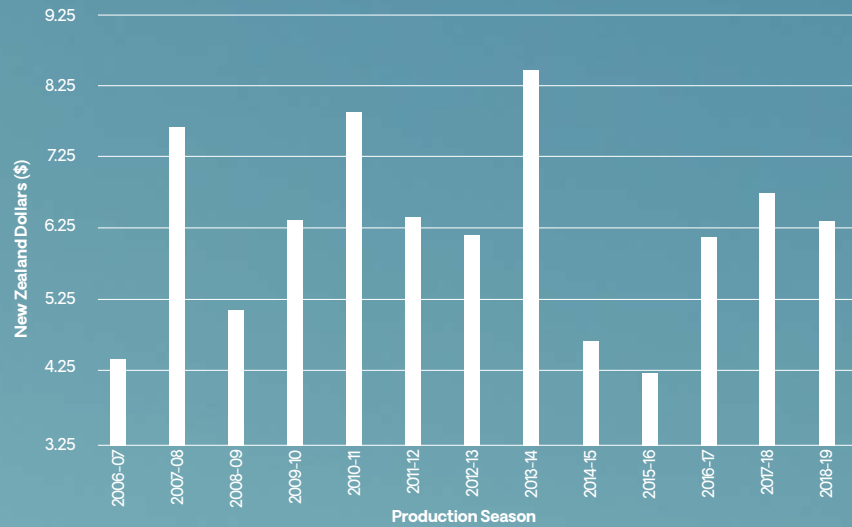


FIG. 22
Cash costs per kg milk solids

Source: Marv Pangborn

Cash costs	Per kg milk solids
Operation costs	\$3.00
Interest	\$1.23
Tax (based on %5.50 milk price)	\$0.24
Drawings	\$0.12
Break even cost (does not include capex or principal repaid)	\$4.59

FIG. 23
An Example of Risk Management Strategy – Hedge Bands

Source: Marv Pangborn

	Futures Market	%Hedged
	\$7.40	90%
	\$6.60	80%
Milk Payout 10 year Average	\$5.90	60%
	\$5.10	40%
	\$4.30	20%

427,400 Kg Ms				HEDGE	50%				
Market Price	\$8.00	\$7.50	\$7.00	\$6.50	\$6.00	\$5.50	\$5.00	\$4.50	\$4.00
50% @ Market	\$1,709,600	\$1,602,750	\$1,495,900	\$1,389,050	\$1,282,200	\$1,175,350	\$1,068,500	\$961,650	\$854,800
50% Fixed At \$6.00	\$1,282,200	\$1,282,200	\$1,282,200	\$1,282,200	\$1,282,200	\$1,282,200	\$1,282,200	\$1,282,200	\$1,282,200
Total Income	\$2,991,800	\$2,884,950	\$2,778,100	\$2,671,250	\$2,564,400	\$2,457,550	\$2,350,700	\$2,243,850	\$2,137,000
Break-Even Costs*	\$1,854,916	\$1,854,916	\$1,854,916	\$1,854,916	\$1,854,916	\$1,854,916	\$1,854,916	\$1,854,916	\$1,854,916
Tax**	\$262,328	\$232,410	\$202,492	\$172,574	\$142,656	\$112,738	\$82,819	\$52,902	\$22,982
Free Cash**	\$874,556	\$797,624	\$720,692	\$643,760	\$566,828	\$489,896	\$412,964	\$336,032	\$259,100

				NO HEDGE					
Market Price	\$8.00	\$7.50	\$7.00	\$6.50	\$6.00	\$5.50	\$5.00	\$4.50	\$4.00
Income	\$3,419,200	\$3,205,500	\$2,991,800	\$2,778,100	\$2,564,400	\$2,350,700	\$2,137,000	\$1,923,300	\$1,709,600
Breakeven Costs	\$1,854,916	\$1,854,916	\$1,854,916	\$1,854,916	\$1,854,916	\$1,854,916	\$1,854,916	\$1,854,916	\$1,854,916
Tax	\$382,000	\$322,164	\$262,328	\$202,492	\$142,656	\$82,820	\$22,984	\$0	\$0
Freecash	\$1,182,284	\$1,028,420	\$874,556	\$720,692	\$566,828	\$412,964	\$259,100	\$68,384	-\$145,316
Difference	-\$307,728	-\$230,796	-\$153,864	-\$76,932	\$0.00	\$76,932	\$153,864	\$267,648	\$404,416

Breakeven cost = \$4.59/Kg ms - tax of 0.25 = \$4.34 For this example
 Stock sales not included
 Capex not included
 Depreciation of \$200,000 included for calculating tax
 Fonterra dividend not included

What did you want to achieve by managing milk price risk?

Other than the obvious reason to control the volatility of milk prices, there are several important aspects to consider. If you desire more security over the price you receive and you know your cost structure, a hedging programme allows a farmer to predict profits and produce more reliable budget forecasts. When these forecasts are entered into a cashflow budget, you will also have more certainty over the cash inflows. With a more secure cashflow you are better able to make strategic decisions. And finally, if profits are more likely, then covering 'unexpected chance events' (e.g. a major machinery breakdown) should be easier.

How did you develop your milk price risk management policy?

There are a few key pieces of information needed before proceeding with a hedging policy. First, a farmer needs to determine their risk profile and business objectives. If an individual's objective is always to maximise profit, and their business can handle the risk of the 'ups and downs' of milk prices, then they probably do not need to participate in the futures market. However, if they are like me and willing to give up the high prices to avoid the low prices, then hedging at an acceptable level could be attractive.

Secondly, a farmer will need to know their break-even point for milk price. This is accomplished by following the process below. Fig. 22 represents our business, which consists of a 50/50 sharemilker and a contract milking arrangement. These are characteristics that are unique to our business.

The next step is to determine the level of free cash desired. Free cash in this example is defined as gross farm income less operating costs, less tax, less interest, less drawings or the money that you have available for capital expenditure, to pay down debt, for education, travel, etc.

When we began looking for ways to make our business more secure, we settled on a free cash goal of \$500,000.

Finally, it is wise to have a policy to stop impulsive selling (usually due to fear of a price crash). The policy (Fig. 23) was prepared by an advisor several years ago and, although possibly out of date, it is an example of following a policy when selling milk futures contracts. In this example, there is little reason to sell a large percentage of production at low prices. As the price increases the level of milk sold to lock in a price is increased.

How do you evaluate the impacts of potential hedging decisions?

We review potential and actual hedging situations in a simple spreadsheet similar to the table above. This table is based on our expense structure, with a hypothetical hedge policy of 50% of production sold at \$6.00.

The table above shows that there is no difference if the milk price and the hedge are the same (\$6.00). However, as the milk price increases the farm leaves 'money on the table' in exchange for security. But, more importantly, if the milk price drops to as low as \$4.00, the farm is still profitable, and the difference between the hedge position and the unhedged position gets quite large.

What do you feel are the key take-out's for others ?

- › You really need to understand your farm, risk profile, financial situation and personal objectives
- › Locking in a price through hedging does not suit everyone – particularly if you cannot stand the thought of 'leaving money on the table'
- › There are a range of firms and products available to manage price risk
- › It is very important to follow a process like that described

A growing market place



The NZX dairy derivatives market has continued to grow strongly, as the fastest of all exchange traded dairy markets globally (Fig. 24). During 2018 the year-on-year growth in total open interest (OI) hit 35.3% which was 3rd highest across all derivatives exchanges globally. In 2019 year-to-date growth in volume is running at over 18%.

This growth has been supported by a range of initiatives the NZX has undertaken to develop the market.

In July 2018 the NZX extended trading hours by shifting the market close back by six hours. The objective of extending hours was to improve access to traders in key physical markets of Asia and Europe. Since this change over 43% of all volumes traded occurred in the extended trading session (Fig. 25).

Further improvement in trading functionality has been introduced with the release of Calendar Spreads. This functionality allows traders to buy futures contracts in one delivery month while simultaneously selling contracts in a different delivery month, by entering a single order. The value of this functionality has been two fold, delivering both an increase in trading volumes of 6% in 2019 year-to-date, as well as a tightening of the bid/offer spread in the front three WMP futures contracts by 38% since launch (Fig. 26).

Additionally, NZX has invested for further growth in the market by undertaking a range of other initiatives including adding sales resource, and developing further web based educational collateral and data resources. NZX as an exchange remains committed to supporting the future development of these dairy markets to maturity and global benchmark status.

The demand for milk price risk management from farmers and the development of an ecosystem centred on NZX NZ Milk Price futures and options.

Increasing regulatory uncertainty, compliance costs, limits on agricultural lending, restrictions in foreign ownership, trade disputes and global economic uncertainty have combined to severely impact business confidence in New Zealand's agricultural sector. This uncertainty comes at a time when strong global dairy commodity prices and favourable exchange rates for exporters are delivering elevated yields and relatively healthy returns at the farm gate. The combination of uncertainty and strong returns have created an environment where New Zealand dairy farmers are demanding tools to lock in favourable prices and take some uncertainty off the table.

FIG. 24

Proportion of total lots traded in dairy futures contracts globally

Source: Bloomberg

- NZX
- EEX
- CME

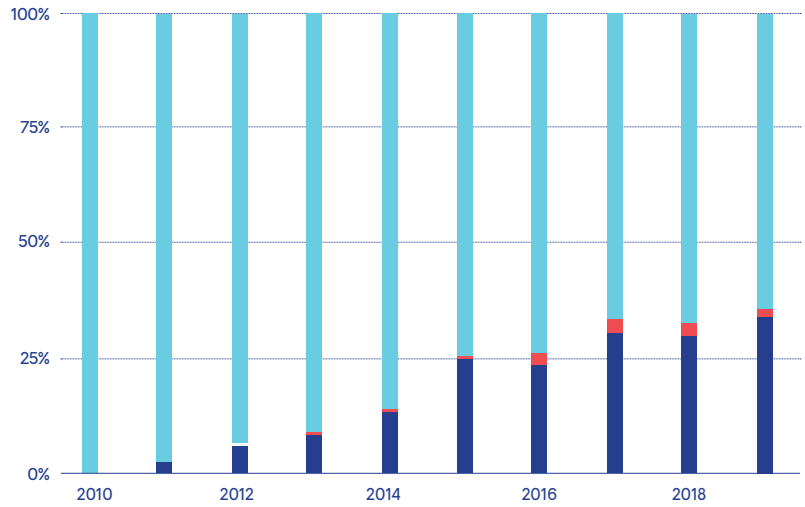


FIG. 25

Orders executed by month since the extension of trading hours

Source: NZX

- 0200-0900
- 0900-1600
- 1600-2200

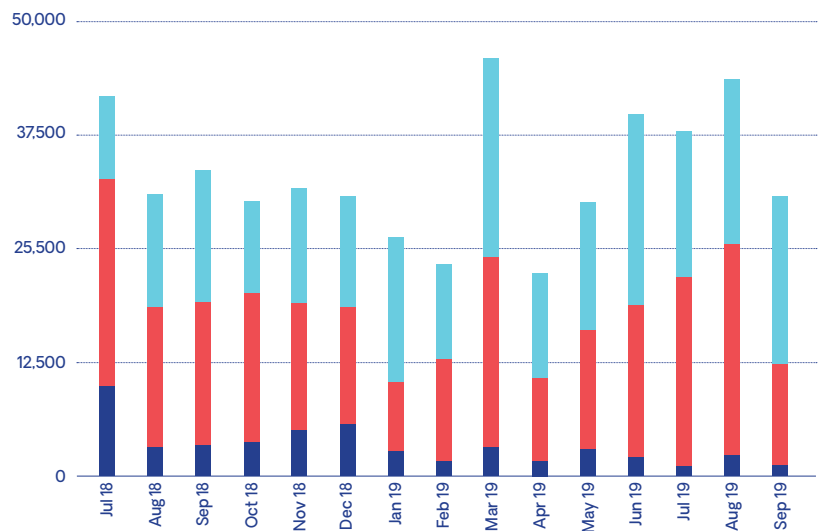


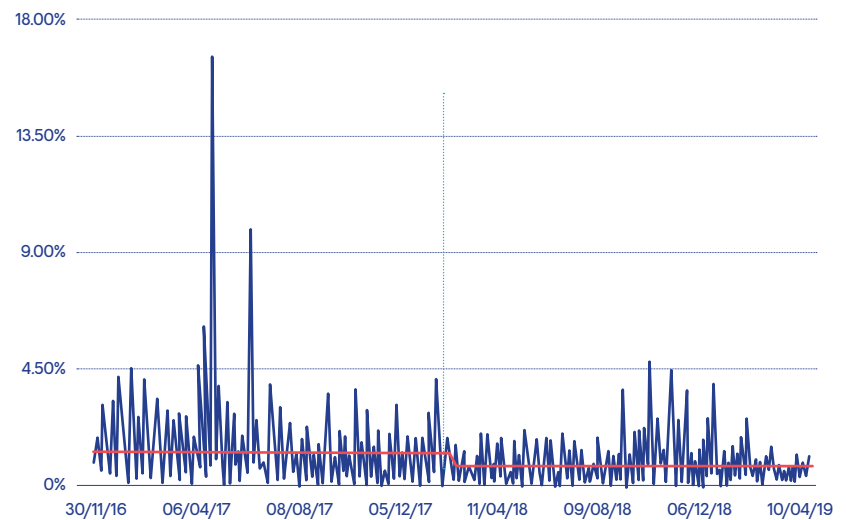
FIG. 26

Average orderbook spread of NZX WMP Futures

Source: NZX

Calendar spreads released March 2018

- WMP spread
- Average spread per period



NZX Dairy Futures



In 2016 the NZX launched the NZ Milk Price futures and options market and in its 3rd year since launch volume traded is on track to represent almost 5%¹ of New Zealand's total milk production. Strong growth in volume traded has also delivered a compression in the bid/offer spread, which in 2019 is averaging 0.67% at market close. The bid/offer spread on the NZ Milk Price contract is the tightest of all NZX listed dairy contracts and is reflective of the liquidity available for efficient execution and price discovery.

The rapid rise of the NZX NZ Milk Price futures contracts into a robust, liquid and transparent product is not only delivering efficient forward price discovery but is now also providing a cost effective mechanism for intermediaries to hedge positions acquired via over-the-counter swaps and forward contracts. In this way the NZX Milk Price has become the centre of an ecosystem of risk management tools for NZ dairy farmers, with four alternative risk management products now available that reference the NZX NZ Milk Price futures prices.

The range of swap and forward contracts available to farmers offer simplified risk management tools that lower the impacts on cash flow by removing the obligation to post initial and variation margin. This simplicity comes at a cost compared to exchange traded alternatives, via either an upfront fee or a reduction in the price offered compared to the futures price, other differences are shown in Fig. 27. Currently, swaps and forward contracts cost farmers between 6.75 and 10 cents per kgMS hedged. Indicative costs to hedge using NZX NZ Milk Price futures over the last 3 seasons have been 4.3 cents per kgMS². The distribution of these modelled costs (borrowing + brokerage costs) per kgMS traded of NZ Milk Price futures in completed seasons³ are shown in Fig. 28.

Fig. 27 Notes:

1. Futures and options have a cash flow implication with initial and variation margin requirements. Some intermediary swap products require security deposits or terms requiring margin after certain price moves.
2. Inflexibility reflects the ability to transact at any time, exit at any time, choose transaction size as well as the ability to trade option contracts.
3. Processor products are only available to suppliers. Access to intermediary products can be restricted depending on processor supplied.
4. Some processors place limits on the percentage of production which can be hedged using fixed price contracts.

1. Based on actual volume traded to 30th September 2019 plus forecast volumes to December 31st 2019 compared against New Zealand's total production of milk solids for 2018 of 1,894 Billion kgMS (DCANZ).

2. Modelling of the financing cost of margin obligations and transaction costs for all farmer short positions during the last 3 seasons. Assuming all contracts are held to expiry, average contract tenor of 420 days, margin is financed from bank facilities at a borrowing cost of 6% pa and brokerage of 1c per kgMS.

3. The cost to hedge with futures depends on the movement of futures prices relative to the hedged position, the financing cost, and the timing of trade.



FIG. 27

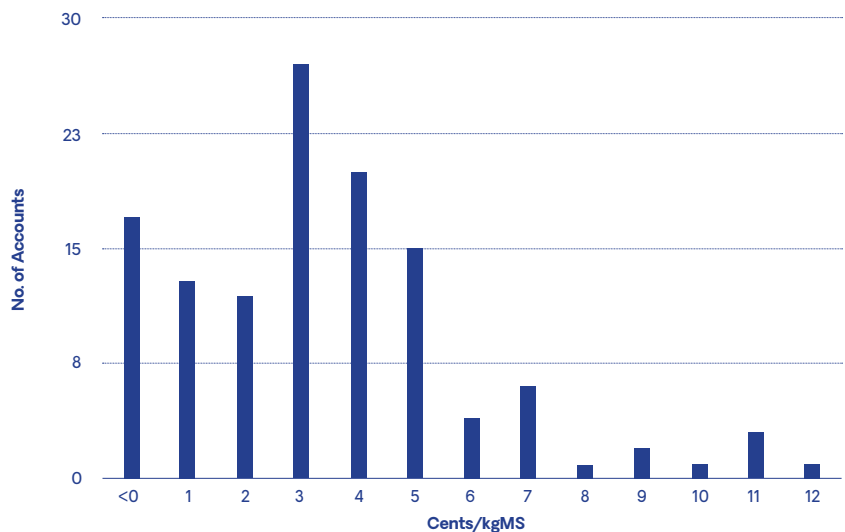
Comparison table of Milk Price Risk Management tools available to NZ farmers

	Documentation Required	Capital Intensity ¹	Time Intensity	Inflexible ²	Cost	Restricted ³	Access Multiple Seasons	Arbitrary Volume Limits ⁴
Milk Price Futures and Options	Most	Most	Most	Least	Least	Least	Y	N
Processor Fixed Milk Price Contracts	Least	Least	Least	Most	Most	Most	N	Y
Intermediary Swap Products	Some	Some	Some	Some	Some	Some	Y	N

FIG. 28

The distribution of modelled borrowing + brokerage costs per kgMS traded of NZ Milk Price futures

Source: NZX



2.1



THE CONS

The consumer sets our pathway

The world's food system is estimated to be worth approximately US\$8 trillion and New Zealand's total food and fibre export receipts for 2018/19 were NZ\$46.5 billion. New Zealand is an export-led economy, selling most of our food and fibre production overseas. Of that, dairy makes up almost 40% of exports.

NZ exports account for less than 1% of the total global food system value and provides the opportunity for us to be nimble and able to strategically target consumers who value what we produce and how we do it.

Once our produce finally reaches the end consumer, be that at a restaurant, supermarket or other outlet, its estimated value climbs to US\$250 billion, driving the desire for us to understand consumer needs as closely as possible.

The difficulty is you can't just average the consumer out. Increasingly, the consumer expects more than a one-size-fits-all approach. There are billions of consumers around the world, who have different drivers for why, what and how they consume.

When considering a target consumer, we will look at the discerning consumer with disposable income who can make choices around what they eat. The four main attributes they will consider when consuming is:

- 1. Health and Wellness**
- 2. Social Impact**
- 3. Environmental impact**
- 4. Experience**

Within each of these attributes are multiple sub-categories, then there is a hierarchy as to how consumers rank the drivers of their purchasing and consumption decisions.

In this section we are looking at each of these attributes - how they relate to demand for New Zealand dairy products, and how consumer expectations may influence local dairy supply.

SUMMER





NEW ZEALAND'S TOTAL FOOD AND FIBRE EXPORT RECEIPTS FOR 2018/19

China experience



INSIGHTS FROM

CHINA

In April I had the wonderful opportunity to attend and present at the China Dairy Development International forum in Nanjing. Following the conference, I spent some time trying to better understand Chinese dairy strategies and Chinese demand drivers. Here are a few of my insights.



1. No one will ever truly crack the code: China is a spectacular country that covers 9.597 million square kilometres, only 12.6% of which can be cultivated. The population numbers 1.386 billion, according to the World Bank, and it is marked by multiple cultures and a rich and diverse history. Each province is virtually like a new country. It's easy to head to Shanghai and think that is 'China,' which is sort of like going to Los Angeles and thinking it represents all of the US. China is beautifully complex and evolving, but don't try to crack the China demand code as it will break you while you are trying.

2. Adversity builds focus and strength: China has experienced war, poverty and famine. As recently as 1976, China was having to ration dairy products to the population. This makes for an extremely resilient and tough nation. Therefore, it is hardly surprising that when they do business, they do it with a long-term multi-generational strategic vision. Securing future food sources is a top priority, as is protecting their country, particularly building certainty of food supply. So next time you think the Chinese are difficult to do business with - I hear people say this all the time - think about how you would operate if you still had a strong memory of war, hunger and poverty. Never underestimate China's ability to adapt or their resourcefulness. Do so at your peril.

3. Passion for the dairy industry is strong: While the dairy industry is relatively small, those who are involved have a wonderful passion for learning and developing an incredibly strong dairy industry in China. Although very different to New Zealand, many of the challenges are similar, such as engaging urban communities, acquiring and retaining talent, valuing natural resources and producing more with less.

4. Getting fresh with consumers: There is rising demand and supply of fresh pasteurised milk in supermarkets. While at the conference, Nanjing Weigang Dairy Company launched its new pasteurised milk product. Even as some countries are reducing pasteurised milk consumption and shifting towards UHT (for convenience), Chinese consumers who are willing to pay more for fresh milk and can afford it are shifting from UHT to pasteurised in the belief that fresh pasteurised milk provides better health benefits. One Chinese-owned farming group in New Zealand is flying fresh milk up to Shanghai weekly.



Julia Jones, NZX
Speaking at event in China
April, 2019

China experience

THE DAIRY COMPANIES SELLING RETAIL NZ MILK PRODUCTS INTO CHINA WORK EXTREMELY HARD, IT'S A FAST MOVING AND FAST CHANGING WELL SERVICED MARKET AND THEY ARE CONSTANTLY SPRINTING TO STAY IN THE GAME, ITS NOT FOR THE FAINT HEARTED.



5. Learn to like it: There is also a growing focus on eating dairy within the Chinese dairy industry with campaigns and programmes set up to educate citizens on the benefits of eating cheese. One scientist at the conference explained that he disliked cheese when he first ate it, but pushed through and described himself as 'learning to like it'.

6. Categorized by country of origin: If you head into a high-end supermarket in China, like a Hema Fresh, and walk down the dairy aisle, you will see brands displayed by country of origin, something that really puts the massive scale of the market into perspective. New Zealand is considered a pure brand and is desired, but many European brands are considered safe and also desired. There are no guarantees, no easy rides, just because we are from New Zealand.

The dairy companies selling retail New Zealand milk products into China work extremely hard. It's a fast-moving, fast-changing, well-serviced market and they are constantly sprinting to stay in the game. It's not for the faint hearted.

7. All for one and one for all: The Chinese dairy industry is very integrated. They strategically coordinate, and when I say coordinate I mean they have a single vision of success in mind for the total industry. They move together. They are all big enough to stand alone, but see the power in working together for a VERY long-term future vision and industry protection. If one company was to falter, you are unlikely to know about it because the other companies would shore it up.



8. You need to be fast and fit:

China is a fast-moving, fast-learning, fast-changing environment. They are strategic, shrewd and strong business people so you need to be fast, agile and ready to adapt to succeed in the food service and retail business in China. It is lucrative and consistently growing but similar to China itself, consumers desires are constantly evolving at pace.

9. They didn't come down in the last shower:

The Chinese government has put in place the Belt and Road Initiative, which is a global development strategy involving infrastructure and investments in 152 countries and international organisations in Asia, Europe, Africa, the Middle East, and the Americas. The idea is to enable easy transportation of product to China, and they will support these countries and organisations financially by investing in infrastructure. They believe the one who owns the infrastructure controls the access of products and will hold true power.

10. Commodity dairy holds great importance:

Although many countries are moving into branded consumer products, within China there is still a strong demand for commodity dairy products as it's difficult for the country to shore up its own supply and meet domestic demand. Don't think your powder is special though. The store rooms look like the United Nations of milk powder with SMP or WMP from all around the world being anonymously added to their product brands. What is most important is that China values the ability to access consistent supply they can rely on. In the hierarchy of desires, best price sits at the top, but consistency of supply isn't far behind.

China is a dynamic and diverse environment and definitely not the sort of place where you can visit one city every month and hope to really understand it. It changes and develops daily, and although Shanghai is modern and future-focused, there are still many parts of the country still in development stages and they will continue to evolve at a huge pace. I would highly recommend that if you are intrigued by the Chinese market, you should go and experience it firsthand. Don't just talk to those you are doing business with, but get deep down to understand the value and depth of their rich history and culture, and how dairy is such an essential part of it.

2.2



HEALTH & W

As populations live longer and many strive for a more vital life, the individual focus on health and wellness continues to grow.

As governments discover that the cost of healing those with ill health is multiples in excess of the cost of prevention we are also seeing a collective global shift in focus at government level. At organization level there is strong focus on health and wellness, as they realize the cost of sick days and low productivity far outweigh the cost of wellness programs. Given dairy's nutrient dense attributes and New Zealand's production methods which helps exacerbate the nutritional quality, the New Zealand dairy industry is well positioned to provide dairy nutrition from cow, sheep and goat to support the global health and wellness movement.

WELLNESS



CHAMPIONING THE VALUE OF DAIRY NUTRITION



New Zealanders' average lifespan over the past five years has increased from 80 to 81.45 years and is expected to rise another half-year over the next five years as life expectancies increase worldwide.

Ageing populations are driving greater consumer focus on wellness, creating an opportunity for New Zealand dairy products to provide the nutritional quality that is a key part of this focus. Fonterra's New Zealand Milk Products brand (NZMP) has a targeted nutritional strategy that is a direct response to this trend.

At the heart of that strategy for Fonterra is creating sustainable value rather than pursuing market scale for its own sake.

In fact, over the next 10 years Fonterra is looking to produce less whole milk powder and switch to higher value protein products, where it expects a growing portion of margin and profit will be made, as existing processing plants reach their natural end of life, assuming no reinvestment.

The nutrition focus will be in three key areas:

- Medical Nutrition
- Pediatric Nutrition
- Sports & Active Lifestyle



Maintaining wellness and supporting lifestyles

Traditionally, sports nutrition has been targeted at athletes. However, this is now one of the fastest-growing categories in the general population as more and more people pursue more active lifestyles. Globally, eight out of 10 consumers today are looking for a functional benefit when they are snacking or consuming a drink, underpinning a \$200 billion industry.

With consumers now seeking nutritional, protein and digestive benefits even when having a 'treat,' the sports nutrition category is growing at 8% a year globally and in the high-20% range in South East Asia and China.

Fonterra has earned the right to play and win in this market because it has extensive knowledge of proteins and probiotics, and existing IP and innovation that responds to emerging consumer lifestyle concerns.

These include nutritional responses to factors like anxiety and stress, which research now suggests is a number one global concern for consumers. Fifty percent of adults report having some trouble sleeping and burn-out is now an officially diagnosed disorder. On top of this, 1.9 billion people – close to a quarter of the global population – are obese. Hence Fonterra's renewed focus on working closely with customers to provide innovative ingredients to help create nutritional support products that address these trends.

Fonterra is looking to bring its deep expertise in these areas to foster collaborative innovation and research to create unique new product attributes. One example: lipids that support cognitive development, which were previously only used in the pediatrics part of the business, are now also used in medical nutrition.

Using dairy nutrition to help heal, recover and age well

Fonterra established the medical nutritional business two years ago to help support healthy ageing. It is now developing products with customers to sell to hospitals and pharmacies for patients who need enriched protein 'power food' for recovery from illness.

New products in this area represent a win-win for patients, who are keen for a speedy recovery, and for governments and insurers, for whom swift patient recovery reduces costs and improves the productive use of health services and infrastructure.

There is also growing demand for products that deal with malnourishment, which is found to be a factor in up to half of all hospital admissions of elderly people. Governments are starting to recognise this and are implementing special programmes for the elderly. Singapore, for example, has launched a programme for over 60s to help them stay active and keep fit.

So Fonterra is looking to reinvent products with their global customers as well as to patent products to tackle these issues. It is looking to formulate products that have better taste, texture, and absorption while speeding up patient recovery and a return to good health. That means creating and launching new products that don't yet exist

CASE STUDY



With more than two billion people expected to be defined as elderly by 2050, with 60% of them in Asia. There is a growing market demand for recovery products that have a higher return per unit than Fonterra's traditional commodity ingredients.

Innovating with medical-grade nutrition requires extensive clinical trials and research. Fonterra will often partner with research institutes or other medical facilities to complete joint research and share costs.

It not just about the product, but also how people consume

Fonterra is also working hard with its customers on products that can be consumed in a variety of ways. For example, a giant 5kg bag of whey protein might be great for a bodybuilder, but unappealing to someone looking for a healthy, no-preparation afternoon snack bar. However, snack bars can often end up going hard on the shop shelf. The opportunity for Fonterra in this example is to develop ingredients that are not only nutritious but also prolong shelf-life and consumer appeal.

How people use products is almost as important as what they want to eat. To understand that, Fonterra mines data sources such as branded social media channels to see what consumers are saying, how many are following its associated brands, and what non-customers are doing. Understanding those trends helps future product development.

The complementary nature of alternatives

It's impossible to talk about dairy these days without including alternative protein sources in the conversation. Fonterra respects how alternative and traditional animal proteins can complement each other in the marketplace.

Earlier this year, Fonterra invested in Motif, a milk protein fermentation company with the growing awareness that people are choosing veganism as a lifestyle or cutting out dairy. Also, with a growing world population and demand for both traditional animal and alternative products, it's prudent to have a clear line of sight over the emerging alternative trends.

Alternatives play an important role but it's not an either/or situation but rather an 'as well as' approach. The big question around the alternatives is the capability to really scale up.

To put it into perspective, at peak scale a fermentation tank could produce a maximum of 300,000 litres (just slightly less than what you would need to fill a 25m swimming pool) in 5 days. At peak production in NZ on average 80 million litres (213 swimming pools) of milk per day is collected, 800 billion litres of milk protein are collected globally annually (which is loads of swimming pools).



To meet 50% of the global dairy demand you would need circa 25,000 fermentation tanks in action.

Cow's milk is nutritionally complex, it is made up of dozens of milk proteins. Some are in the same protein family and some are completely different families. It would take multiple fermentation vats to produce all the milk proteins that cows effectively produce in one 4 legged self-replicating fermentation tank. Without the complexity, it would be difficult to produce medical nutrition. Currently research is focused on the high value of proteins and there's almost no research for medical nutrition that is non-dairy based. If you want to do a plant-based alternative, you need to consume 25 times more than you would need from cows milk. Given it is difficult enough to get food into a recovering patient, it's not desirable to have to increase the volume of intake.

All the clinical trials and all the opinions of key opinion leaders, show that dairy protein or especially whey protein plays a big, big, big role. Alternatives have not been proven to support this area of nutrition yet but there might be potential for this in the distant future.

It's important that people understand the facts to allow a balanced perspective and see a collaborative relationship with animal dairy and alternatives. To produce cellular milk you need sugar and a nitrogen source. It can take up to 10kg's of sugar to produce 1 kilogram of protein. From this you are likely to produce 3-4 kilos of non-sugar waste biomass which is then – ironically – fed to cows.

Producing alternative products still generates waste and there is an issue with what to do with the waste. Fonterra don't see this as a negative. It's about complementing animal with non-animal. This could even be part of supporting a circular economy, feeding waste from one system to drive another system. We can use both to provide ecological and nutritional balance.

New Zealand is well positioned for future consumer's expectations

New Zealand pasture-produced cow's milk has a macro nutrition similar to other production methods, however, it is slightly higher in levels of antioxidants. Although other production methods around the world are good, NZ pasture-based milk is great. The great quality can't be attributed to one thing but is a combination of how we holistically farm. It's our animal breeds, which are bred to hold less milk, keeping the nutritional density concentrated. It's also our natural mix of pastures that we allow our cows to forage freely on.

Most importantly, it's our people who consistently strive to improve how they farm and meet consumer and community expectations. For all of these reasons we see a very bright future for New Zealand's pasture-based production and we also respect that we will need to keep working hard to earn that right.



THE SHEEP MILK REVOLUTION

When you experience the Spring Sheep Milk Co. you can see and feel how their culture and vision are integrated into everything they do, from how they care for the environment, their animals and teams all the way through to the end consumer of their high-value products.

We had an opportunity to sit with Scottie Chapman, CEO, and Nick Hammond, COO, to understand more about Spring Sheep and their commitment to success.

How would you define your milk production philosophy?

Consumer-led production. It's not just about understanding what product category the consumer wants but also focusing on what they expect in regard to the production of the products. Before starting out we did extensive research into the consumer market to really understand where the commercial opportunity would be, both by category and geographically. This is an ongoing process. You can't research once; consumer desires and needs change continuously and you continue to develop with these changes. We will continue to enter new markets, but only at a pace that enables sustainable production scaling.

This philosophy includes thinking of our stakeholders in New Zealand, our neighbours, our communities, and ensuring we understand what they expect from us too. We are committed to maintaining our social licence in order to provide operational certainty, which provides production certainty. We believe in doing what is right.

Our international consumer wants 'free from' nutrition: free from antibiotics, free from chemicals, free from genetic modification. Our domestic community expects that we have high animal welfare standards, a positive impact on the environment and that our teams have an enriching experience. We are wholly committed to delivering all expectations.

Sheep are sensitive creatures and stressed or 'unhappy' sheep don't produce well. Our flock of 5,000 elite dairy sheep living on our central North Island farms graze free-range on beautiful rich white and red clover pastures, and on our hybrid farms they also enjoy weather-proof shelters. Sheep aren't inclined to do anything they don't want to, so milking these sheep requires everything on the farm, in the milking parlour, and in the lamb-rearing process to be calm and in tune with the natural flow of the sheep.

What makes sheep milk truly unique?

Sheep milk is truly special; it is one of the most nutritious milks available and may be helpful for people with cow's milk allergies and stomach or digestion intolerances. We often refer to it as nature's super-milk!

One of the key bits of feedback we get back about sheep milk is that some people who struggle with digestion or have an upset stomach from drinking cow's milk are able to enjoy sheep's milk. Studies have found similar results.



CASE STUDY



SHEEP MILK NATURALLY CONTAINS UP TO 60% MORE PROTEIN AND CALCIUM WHEN COMPARED TO GOAT AND COW MILK.

We are doing a lot of work to understand all the processes that create this result but there appear to be lots of different, great things about sheep milk that help this to occur:

- Proteins in sheep's milk are very different to those in cow's milk, in both structure and composition;
- Sheep milk is lower in a protein called alpha-S1 Casein, which has been linked to allergic sensitisation in young children;
- Sheep's milk is naturally an A2-type milk, free from A1 beta-casein protein found in most cow's milk. A1 has been associated with digestive discomfort such as painful cramps and bloating;
- Sheep's milk is also higher in short to medium chain fatty acids, which means these fats may be easier to digest due to more efficient metabolism;
- Sheep's milk is also easier to absorb. The absorption of important nutrients like amino acids, the body's building blocks, is significantly higher in sheep's than cow's milk.

We have recently completed full clinical trials looking at the health benefits of sheep's milk on humans. Although we are not in a position to share details, the results were favourable and we are looking forward to releasing the details later in 2019.

Sheep's milk is also naturally richer in many vitamins and minerals. Fresh sheep's milk has higher levels of vitamins - A, B₁, B₂, B₆, B₁₂, C, E - and minerals - Calcium, Magnesium, Phosphorous, Zinc - than cow's and goat's milk. Sheep's milk naturally contains up to 60% more protein and calcium when compared to milk from goats and cows.

It's not just nutritionally unique. It also has a special structure. Sheep's milk needs to be carefully handled to maintain its quality so keeping milk really cold is important. We ensure milk is held at less than 2 degrees Celsius - well ahead of some industry standards for food safety and quality.

Even our transportation methods are careful, using modern methods with low agitation systems, designed to protect the quality and structure of the milk. Preserving the unique attributes of our sheep's milk is all part of our desire to respect the product from production to consumption.



What are your products and who are they targeting?

Our consumer focus is the first 1,000 days of a human's life and providing them with naturally digestible protein that is nutrient-dense. When we started, we worked through a series of products to test the market. While all the products, such as gelato products, were popular, they didn't all have a sustainable commercial model. The products we have available now are sheep milk powder, three different kinds of sheep milk calcium tablets, which also include added probiotics, DHA and Iron, or Vitamin D3, and the recently launched toddler formula. All products have no added preservatives and are a great source of calcium.

Geographically, our focus is South East Asia. We are currently in Malaysia, Vietnam, Taiwan and a few cities in China.

As your customer base grows, what are your plans for securing future supply?

We will continue to enter new markets, but only at a pace that enables sustainable scaling of production, which means scaling based on demand. It was an important part of our business model at the start to intimately understand supply methodologies so we could clearly establish what a socially, environmentally and economically viable farming model looks like.

Looking to the future, as we need more supply we are keen to bring farmers on as suppliers using a franchise-type model. Our suppliers will be those who have passion and absolute pride in animal farming and those who align closely with our values and philosophy. We won't compromise quality for supply and we want genuine business partnerships. We will work very closely with new suppliers, providing a farming 'blue-print' for guidance and support. Farmers will be brought in to understand everything about how we operate and our consumer insights so they understand why we require them to produce in a particular way.

It's extremely important that our suppliers' businesses are financially viable. We are currently working closely with some suppliers to support their conversion journey and provide long-term commercial contracts for supply. We see this as a great opportunity for those highly skilled producers to diversify and complement their existing businesses and diversify land use, giving them a viable commercial option to lower their environmental impact.

The data we've collected over the years provides an incredible level of insight for any new starters in the industry. We have collected data on environmental impact right the way through monitoring each milking ewe.

For each milking ewe, we know exactly how much milk she is producing as well as overall volumes so we can monitor trends over time. This information isn't just about monitoring supply but also allows us to carefully monitor the health of our very precious sheep.

What's next?

We have openly shared what we've learnt on our journey to improve the overall quality of the industry and we will continue to do this. New potential markets will be developed and partnerships with suppliers will continue to grow as we seek to ensure both our commercial viability and growth while maintaining strong values and ensuring environmentally sound decision-making.

We want Spring Sheep to support the future success of New Zealand's food and fibre industry and we believe we can extract financial value without compromising our environmental or social values, being good for people and the planet.



Scottie Chapman
Chief Exec. & Director
Spring Sheep



Nick Hammond
Chief Operating Officer
Spring Sheep

Did you know...



**Aside from cattle,
many kinds of livestock
provide milk used by
humans for dairy products.
These animals include water
buffalo, goat, sheep,
camel, donkey, horse,
reindeer and yak.**

The first four animals
respectively produced about
11%, 2%, 1.4% and 0.2% of all
milk worldwide in 2011.

Naturally found in a glass of standard milk...

**High quality
protein**

Helps to grow
and repair muscles

**Vitamin B2
(Riboflavin)**

Helps to reduce
tiredness

Vitamin B12

For normal
brain function



New Zealand milk is high in CLA, a polyunsaturated fat. Milk from grass-fed cows contains a concentration of conjugated linoleic acid (CLA) two to three times higher than that found in the milk from grain-fed cows.

CLA is a polyunsaturated fatty acid found in milk fat. Evidence continues to indicate that CLA provides a wide range of potential health benefits. These include helping to regulate immune function, maintaining cardiovascular health, anti-inflammatory properties and supporting hormonal balance.

A glass of milk is partially visible on the left side of the page, with the text 'Phosphorus' and its benefits overlaid on it.

Phosphorus

Supports energy metabolism

Potassium

To help maintain a healthy blood pressure

Vitamin A

Supports vision and immune function

2.3



SOCIAL IM

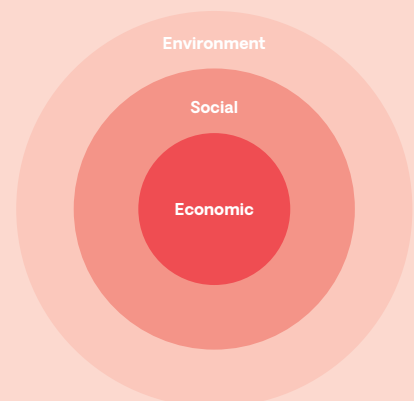


IMPACT

Social impact is increasingly becoming a game of two halves

As dairy has grown the focus on its impact on environment has drawn strong focus from urban communities. This focus goes beyond environment through to animal welfare and the working conditions for staff, the consumer and our urban neighbours have an expectation that when we produce dairy we will do so with the utmost respect for environment, animal and human welfare.

This has created a high level of tension at times and provided an introspective lens for the dairy industry when looking at how they would evolve in the future. The economic benefits of dairy are strong for New Zealand communities however we need to ensure that we don't compromise our environment and find a healthy balance to ensure we have sustainability across environment, social and economics.



This sustainability model ensures that environment, social and economics work together but environment is not compromised for economics, and the economics can only grow at a rate that the environment and communities can sustain.

Social impact

The Dairy industry supports strong communities

DairyNZ estimates about 46,000 people were employed in New Zealand's dairy sector in the 2017-18 season, of which 34,000 worked on-farm, and 12,000 in processing and wholesaling. That is about 1.2% of the country's estimated working age population¹.

According to an NZIER report released in February 2017, dairy employment has grown at an average annual pace of 3.7% since 2000, more than twice as fast as total employment.

Dairy provides more than one-in-five jobs across three territorial economies (Waimate, Otorohanga, Southland), and more than one-in-10 in a further eight territorial economies (Matamata-Piako, South Taranaki, Hauraki, Waipa, South Waikato, Clutha and Kaipara).

The sector's impacts flow well beyond the farmgate and processing plant, reaching into the wider rural sector, financial services, and manufacturing to name a few.

NZIER estimates that in 2016, farmers spent \$711 million on fertilisers and agrichemicals, \$393 million on forage crops, and more than \$190 million buying agricultural equipment. Farmers spent \$914 million on agricultural services, \$432 million on financial services and \$197 million on accounting and tax services.

The dairy processing sector also spends about \$288 million on packaging, \$199 million on hired equipment, and \$174 million on plastics. DairyNZ estimates that farmers have spent over \$1 billion in recent years on environmental management systems.

¹ Using statistics from Statistics New Zealand's Household Labour Force Survey, which currently uses 2013 Census data. References:

Quickstats about dairying 2017-18, DairyNZ, <https://www.dairynz.co.nz/publications/dairy-industry/new-zealand-dairy-statistics-2017-18/>

Dairy trade's economic contribution to New Zealand, NZIER, February 2017, https://nzier.org.nz/static/media/filer_public/29/33/29336237-3350-40ce-9933-a5a59d25bd31/dairy_economic_contribution_update_final_21_february_2017.pdf

Dairying has been a growth industry in New Zealand for most of the past decade, albeit at a slowing pace since the 2015-16 season when global prices were in a trough. It is an important sector in most regions of the country, whether directly through farming, or through processing or other support industries.

The dairy industry has grown faster in the South Island than the North Island. South Island farms – particularly some of the newer, larger farms – tend to be a higher production system, and require more inputs. This growth is likely to slow as the regulatory environment becomes stricter, and costs continue to rise.

Despite the South Island's faster growth, the North Island has more dairy activity, with Waikato the country's largest dairy region. Several of NZ's dairy processors have factories in the region. The most recent to open has been Synlait's Pokeno site.

In 2017-18, Waikato produced 22% of NZ's total milksolids followed by North Canterbury at 16%. The North Island has more cows and total effective hectares attributable to dairying than the South Island. Some 59% of NZ's cows are in the North Island, and graze on 61% of NZ's dairy land area. Of this, Waikato accounts for the largest proportion – 23% of the national herd and 22% of the effective land area.

South Island cows tend to be more productive than their North Island counterparts, with a greater amount of milkfat, protein and milksolids produced per cow. On average, in the 2017-18 season, a cow in the South Island produced 222kg of milkfat, 175kg of protein, and 397/kgMS. A North Island cow produced 197kg milkfat, 151kg protein and 349/kgMS. South Island cows are more likely to be fed supplementary feed, whereas the North Island tends to be more pasture-based.

Across New Zealand's farming business's health and safety continues to be one area in social impact where we need to significantly lift our game, although this is not solely a dairy farming issue due to the large scale of the dairy industry statistically it gets more focus.

Working conditions have significantly improved however as new generation enters the industry their desires and expectations on conditions have evolved this includes hours worked and having weekends off. Many farmers have embraced the opportunity for flexibility and where on average you would expect a farm worker to work 14 days straight before having a day off many are now working on a variety of rosters that have more flexibility in hours and days worked.

Demand impact

Although our domestic consumer and general public can be very hard on the New Zealand dairy industry the international consumer continues to desire our products and puts a great deal of value on how we farm. Our animals free range graze nutrient dense pasture and as a country we work hard to only use antibiotics when it is of importance for animal welfare. The offshore consumer sees New Zealand as a responsible producer.

Supply Impact

To meet the needs of the offshore consumer and value the needs of our urban neighbours it can be an extra investment for farming business in either cost for further wages when employing extra people to accommodate flexible shifts, or the reduction of cows to ensure the highest animal welfare is applied. When new strategies as the above are executed well the impacts are often short term and can often provide an increase in supply long term.



FIG. 29
Regional milk production

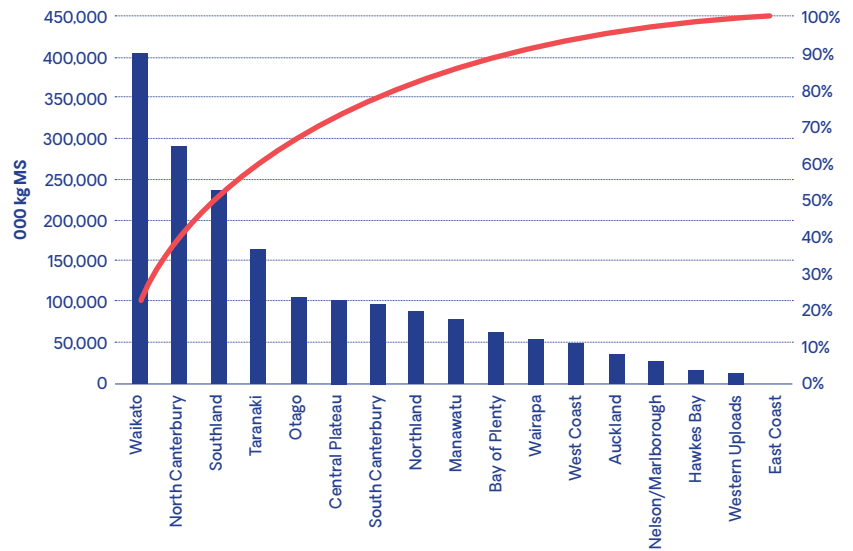
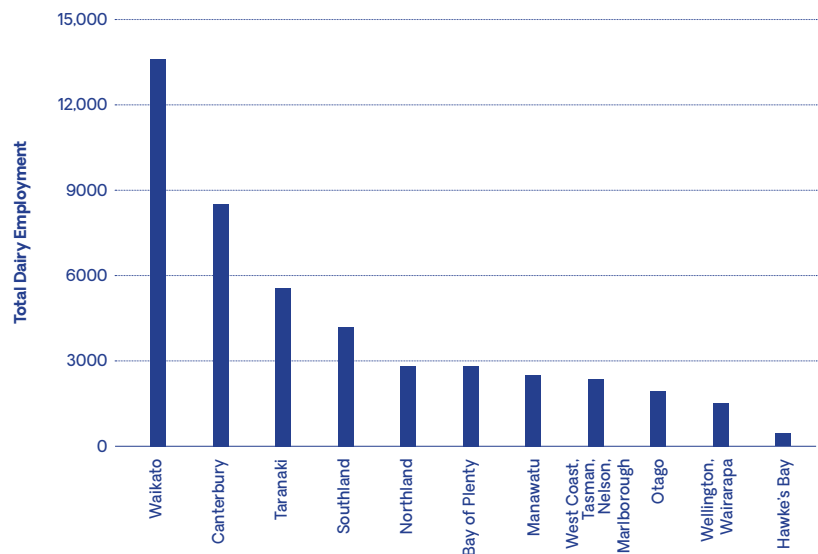


FIG. 30
Regional employment numbers







PEOPLE EMPLOYED IN NEW ZEALAND'S DAIRY SECTOR

Organics

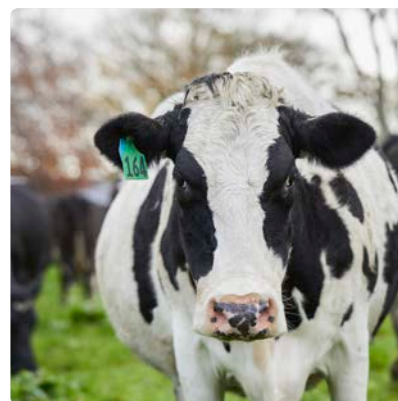
Organic is a definition of a food production process, it covers the resources used and how they are used, animal welfare and human welfare, it is a holistic way of producing.

To certify as organic takes strong commitment, the certification process makes all farm processes very transparent and is regularly monitored. Certification standards vary across countries, often those most committed to organic production will target the strictest certification regime so this will cover multiple countries.

Areas that are looked at in certification are:

- Waste
- Production
- Processing
- Land management
- People Management
- Administration (how you record and measure, monitor in your business)
- Water use
- Feed
- Welfare

Although globally there has been an increase in organic dairy production it does come with its challenges and requires a large level of commitment and a real belief in the organic philosophy. Although as an organic producer you can control what happens on your own land when buying in feed or purchasing other external products such as fertilizer it can be challenging to get the standards you require. Technology has been engaged more by a number of organic dairy farmers where the value comes in monitoring real time wellbeing of animals and being able to prevent illness. Interest in organic continues to grow as consumers desire products that are 'free from' in nature.



Total organic global milk production (2017)

798.5
BILLION LITRES

97%

of all milk produced was bovine-derived



83% Cow Milk

14% Buffalo Milk

Organic dairy farming costs

1.3 TO 1.6 X HIGHER

than conventional dairy farming costs



AT FARM GATE

the premium price that organic milk earns compared to conventional milk varies from **27% to 44%**, depending on the country.



AT RETAIL

the premium price that organic milk earns compared to conventional milk varies from **9% to 53%**, depending on the country.

Globally

Certified organic milk accounts for approximately

0.9%

of global dairy milk production



The global value (USD) of organic milk production is estimated at

\$4.3BN

USA, China and Germany are the largest producing countries



CASE STUDY



Organic Dairy Hub Co-operative NZ Ltd
organicdairyhub.co.nz

A GREAT NEW ZEALAND FARMING STORY BUILT ON PEOPLE, VALUES AND PRODUCING THE **BEST DAIRY FOR THE WORLD**



In 2015 a group of organic dairy farmers saw an opportunity and came together to officially form The Organic Dairy Hub Co-operative NZ Ltd (ODH), New Zealand's only 100% farmer owned organic dairy co-operative.

They believed that by standing together as one strong group, with a common passion for producing high quality food, a robust strategy and sound business model Organic Dairy Hub Co-operative would become the preferred organic dairy supplier/producer for NZ and for the international market.

ODH provided the platform to showcase some of NZ's most highly skilled organic farmers, working together to strengthen the NZ organic sector, bring organics to the forefront while having a strong connection with the land, animals, environment, their families and their communities.

What inspired the setup of the Organic Dairy Hub?

Frustrated with the current lack of future directional drive of the organic dairy sector this group of certified organic farmers in the North Island of New Zealand could see that certified organic food meets the growing consumer desire for food safety, security and transparency This led to the decision to set up as a farmer owned cooperative with a dedicated focus on organic production, that is agile , forward thinking, that strives to be one step ahead of what the customer is looking for and is able to meet the future needs of both the farmer and customer.

There was a true desire to set up a business where all shared in the passion for organics that had a real family feel to it, where every person counted, was engaged and valued.

It's very much in shareholders hearts to produce organically, they take pride that the co-op farmers meet some of the strictest organic standards in the world, all ODH farmers are independently audited by third parties ensuring full transparency behind the food they produce so ODH customers have the peace of mind that there is absolutely nothing but natural in the food being produced.

Once the decision was made to set up ODH, was it smooth sailing?

Making the decision to set up the cooperative was the easy part. In the following years success has come but never in a direct route which has been good for the co-op as it has brought both challenges and opportunity but most of all it has brought strength within the shareholding. ODH has quietly built up their milk supply to meet the increasing demand, the focus has been on a strong future focused strategy and it's about walking their own path in developing the business commercially, before turning to developing a public profile.

Shareholders were committed from the outset to take the time to plan and really understand what was needed for the co-op to be successful. Building the right culture within the co-op has been critical, a culture that is understood and embraced by the shareholders, setting up the right governance and management structure and developing a solid constitution to guide the business. The Long-term success would be down to the shareholders and ensuring a strong foundation was formed to build upon for future success and that is exactly what has happened.

The business became operational in June 2015 with one contract, one tanker, and nine farmers supplying liquid milk to one processor. As a start-up, ODH farmers understood the risk but could also see the rewards would far outweigh the risks. It was understood by all that the co-op had a long term vision, it was never about today or tomorrow or the next 5 or 10 years, the co-op was formed to be intergenerational and it would be the future generations that would truly see the rewards.

In 2019 ODH has six tankers, multiple contracts, and 35 committed organic farming families who support the co-op and each other with their collective energy for continual growth. ODH organic milk is processed into a range of products – liquid milk UHT, butter and cheese, milk powders, and premium organic New Zealand dairy products. ODH milk is in products that are sold in boutique food stores, local supermarkets, or retailers across the globe.

What is your product mix?

ODH is focused on creating premium New Zealand organic milk and milk products and prefer to leave the commodity products for other manufacturers. There are much bigger organizations that dominate the space of high volume products. ODH know where they fit in the market, high value high quality product.

ODH ensures their farms are achieving the highest organic certifications and market accesses and are focused on making milk into as many different premium components as possible to satisfy the wide spread of contracts and enquiry they are receiving.

Organic Dairy Hub Co-op have the ability to produce:

- Bottled organic liquid milk and cream
- Bottled and tetra organic UHT milk and cream
- Organic butters, cheeses, yoghurts and other cream based fresh dairy products
- Organic Whole Milk Powder, Organic Skim Milk Powder, Organic formulated base powders for paediatric applications
- We are also developing processes to produce diverse, high value nutritional and protein based dairy ingredients for infant, elderly, sports and sensitive consumers

Their newest milk products being produced are from A2 bred cows

- NOP Organic Whole Milk Powder from A2 cows
- NOP Organic Skim Milk Powder from A2 cows
- NOP Organic formulated base powders from A2 cows
- Myriad fresh dairy products made from NOP Organic A2 cows' dairy

The unique organic farming practices developed on our New Zealand farms to produce premium organic fully certified milk from A2 bred cows adds to the already identified health benefits of organic milk.

Organic Dairy Hub Co-operative is a proud co-operative that has the capability, technical expertise and agility to be able to produce unique future focused products for our customers specific demands.

CASE STUDY



What do you see as the key drivers for your success?

There are four key areas that define our success:

1. Strong working partnerships that reflect both the Co-op value as well as the customer values.

Understanding the customers needs and delivering on expectations this adds value to both businesses. Working in with processors, other smaller suppliers, customers and stakeholders. Building long term mutually beneficial strong relationships and close collaboration to produce high quality products. ODH consider their customer relationships as partnerships and ensure that they are always long term and win-win for both parties. All parties working together are introduced to ODH values and always recognized the farmers for the incredible work that they do to produce the raw ingredient.

2. Practical and agile operations.

ODH farms are spread across a large area and efficiency in moving the milk to the right processor is key in delivering the right product. Optimizing available infrastructure is a key focus for the processing of milk into the range of products the customers request. ODH also works with external processing and packaging partners.

The long-term strategy for ODH is to be a vertically integrated business focusing on producing high quality products, allowing ODH business partners to have real relationships

with the dedicated highly skilled team. ODH partners see the benefits of talking to real people who can handle all facets of the business, where solutions and customer service is a focus.

3. Ensuring the ODH farmers are rewarded for the incredible work they do. Every business decision made is for the betterment of their livelihood and their families They understand the importance of raising the bar higher than the minimum standard requirements, to drive farm, social and environmental performance on farm. High performers are rewarded and acknowledged for on farm excellence The continual achievement for higher levels of excellence is key to growth. A2 milk production and breeding program is a great example of where our farmers strive to achieve more and be rewarded for it.

4. Taking the farmers on the journey of food production. Each farmer needs to understand the full journey of their milk being part of the whole process from the time they turn the lights on in the cowshed in the morning to the moment their product reaches the consumer. ODH is connecting farmer with customers, helping them understand what the consumer want. ODH takes their farmers to see the processing plants so they understand the needs of the production teams so they can better understand what they can do on farm to make better products.

ODH farmers will strive to produce the highest quality and to the highest certification levels if they understanding the 'why' of their co-op.

What does it take to become a shareholder farmer of the ODH Co-operative?

ODH is not rushing out to sign up any old farm - it's not volume game - it's about the right people and returning value to the shareholders. To be highly successful it must be sustainable with a have long term vision for the farmer shareholders, this is something the ODH Board have place a great amount of emphasis on. ODH has said they don't need to be the biggest co-op, but will strive to be the best.

Long term success will be about ensuring the co-operative has the right people with common goals, values and commitment, ODH makes no apologies for being strict on who becomes part of the ODH co-operative family. There is a rigorous process to go through to become a shareholder; for any potential new shareholder every aspect of their business is look at, it is about how they operate, their farming practices and philosophies.



Due diligence includes:

- Looking at what their current farm operations are like
- What is their level of financial management/business/farming acumen?
- Are they good employers?
- What is their farming history, and have they had any conduct infringements?
- Understanding their journey, their goals and building their organics expertise
- Do they understand and align with the ODH values, goals and culture?

To obtain and maintain organic certification requires time, commitment, traceability and transparency across all activities of the farming operations. ODH focus is on their farmers achieving the highest level of organic certification for global access, so the standards and expectations for an ODH shareholders are very clear from the start. This includes checking each farm has a social justice policies, an annual audit of employment contracts to check staff are paid a fair living wage, and they have good working and living conditions. Understanding and implementing animal welfare practices and being aware of law and environmental changes. All ODH farms are internally and externally auditor annually

The sharing of information and learning happens within the co-op, where existing fully certified organic farmers provide support for any new farmers while in conversion to organics to aid in their success. ODH hosts on farm discussion groups which ensures support is wrapped those that need it. The farmer to farmer discussion groups provides the platform to connect with those starting out on their organic journey with other more the experienced certified organic farmers.

What will ODH look like in ten years?

A truly global dairy exporter, producing high value, sought-after ethical premium products.

Happy and content shareholders with continued good co-operative returns and continuing to be at the forefront of dairy innovation, sustainability and nutrition without losing sight of what it means to be a cooperative.

Continually developing the business in areas that will at value.

Will be an excellent place to work, where staff are happy, and attract great people.

ODH will be the conduit between governments, industry and legislators through to the farmers on the land.

Regardless of how large ODH grows the values will still hold true.

What's one thing you want the Dairy Market to know about ODH and Organic farming?

Organic Dairy Hub Co-operative is NZ's only 100% farmer owned organic dairy co-op, where the focus of the business is on organic products.

Customer focused with the agility and flexibility to deliver what customers are looking for.

Savvy future focused businesspeople who understand the balance of environmental and financial positioning.

Producers of New Zealand, grass fed, GMO free, certified NOP, EU, NZ, China organic, A2 dairy products – just give us a call...and a real person will answer.



Clay Fulcher
Chief Executive

2.4



ENVIRONMENT

The environment is essential to not only preserve but we must also work hard to improve its current condition.

As New Zealand pushed to play the volume game it tipped the balance of economics and environment out of favour for environment. Over the last 5 years farmers across New Zealand including dairy farmers have worked hard to get the balance back to ensure future generations can enjoy a productive and healthy environment. We know in New Zealand this is not unique to us as many parts of the world look hard to see how they can regenerate environments while producing food.

What is unique to New Zealand however is, Kaitiaki this is a Māori (New Zealand's indigenous people) term used to describe guardianship, for the sky, the sea, and the land. The kaitiaki is a guardian, and the process and practices of protecting and looking after the environment are referred to as kaitiakitanga. Application and the power of these principles in food production are explained in the Miraka case study in the experience section of the report.

Moving forward New Zealand's focus is on climate change, focusing on both carbon and methane (which comes from animals) and also ensuring the wellness of our essential fresh waterways. Given animal farming is such a significant part of New Zealand's demographic it's also one of the largest contributors to carbon (this includes methane) for New Zealand. The flip side to this however is given our farming methodologies, commitment from farmers and industry groups and vast landscapes with trees we also have wonderful opportunities to offset carbon work towards being good for the environment while we farm.

There is pressure however on production on the environment means there will need to very careful management in the future which is highly likely to impact the future levels of milk production possible in New Zealand within cow dairy industry. Sheep dairy is estimated to have a third of the impact of cow dairy and is an emerging opportunity to compliment the cow dairy production and support environmental wellness.

Although regulation will bring a level of pressure for change the true catalyst for change will come from the consumer demands on behavior change and the industries desire to ensure future generations are proud of how we have cared for the land that will be passed on to them.

MENT

Environment

Carbon and climate change

Between 1990 and 2011, New Zealand emitted an average 0.1% of global net greenhouse gas emissions (GHG), according to Ministry for the Environment data.

If we put our domestic hat on, 48% of New Zealand's gross GHG emissions were generated from agriculture in 2017. The primary source of those emissions are ruminant livestock in the form of enteric fermentation (i.e. methane - CH₄), which makes up around 71% of agriculture's GHG profile, and contributes 34% of New Zealand's gross emissions. Ministry for the Environment data shows.

How does this relate to the New Zealand dairy sector? New Zealand had an estimated 5 million calf dairy cows and heifers at 30 June 2018 (see Fig. 31), and if we include all other dairy cattle as defined by Statistics New Zealand, there were a total of 6.4 million head. So what is New Zealand doing about GHGs, how does this impact the dairy industry, and what do the numbers look like?

What is New Zealand doing, and how does this flow through to dairy?

At a national level, to transition New Zealand to a low-emission and climate resilient economy, a Climate Change Response (Zero Carbon) Amendment Bill has been developed and is under review to provide a framework for climate change policies. This amendment bill – as it relates to the dairy sector – is currently set to reduce biogenic methane emissions to 10% below 2017 levels by 2030 and 24-47% below 2017 levels by 2050. This is set to come into force under the Zero Carbon Act in late 2019.

The next questions are: what rules will govern New Zealand's agricultural sector to achieve these goals and how will those rules impact the business of New Zealand's dairy sector over the coming years?

What rules are going to govern New Zealand agriculture?

To achieve these targets, the New Zealand government has agreed with industry on a proposal to put a price on agricultural emissions at the farm level from 2025. In addition to this, there are two options for managing emissions in the interim: either put a price on emissions at the processor level, or establish a formal sector government agreement.

In the interim, New Zealand's agricultural sector is lobbying for agreement between government and industry to finalise a programme of action. This has been outlined in the Beef + Lamb New Zealand document 'Primary Sector Climate Change Commitment'. The preferred approach by government is for a price at a milk processor level, but this is not deemed by industry to be effective as it does not recognise or incentivise efforts to mitigate GHGs at the farm level. While an average emission factor and levy can be added at a processor level, there remains no accountability at the farm level. Industry is lobbying for an agreement to allow farms to recognise the good work that they are doing towards GHG reductions by treating emission calculations and costs on a farm by farm basis.

Once we get to 2025, the government has been clear that there will be no 'loose' self-regulation by industry. With a price on agricultural emissions at the farm level, farmers will need to calculate their emissions and pay for, or offset them, accordingly.



FIG. 31

New Zealand Dairy Industry
(Year end 31 May)

Source: NZX, LIC

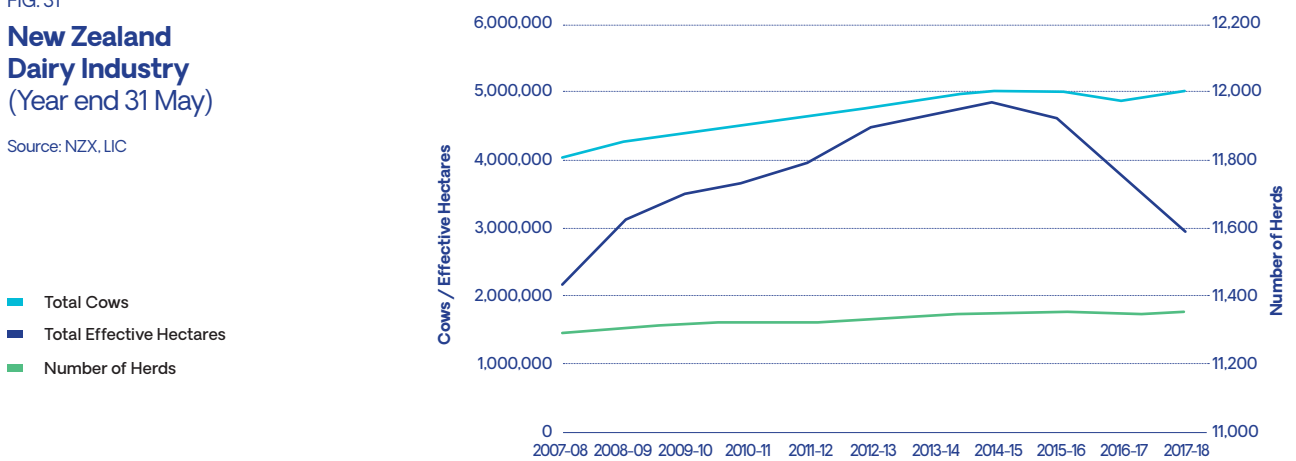
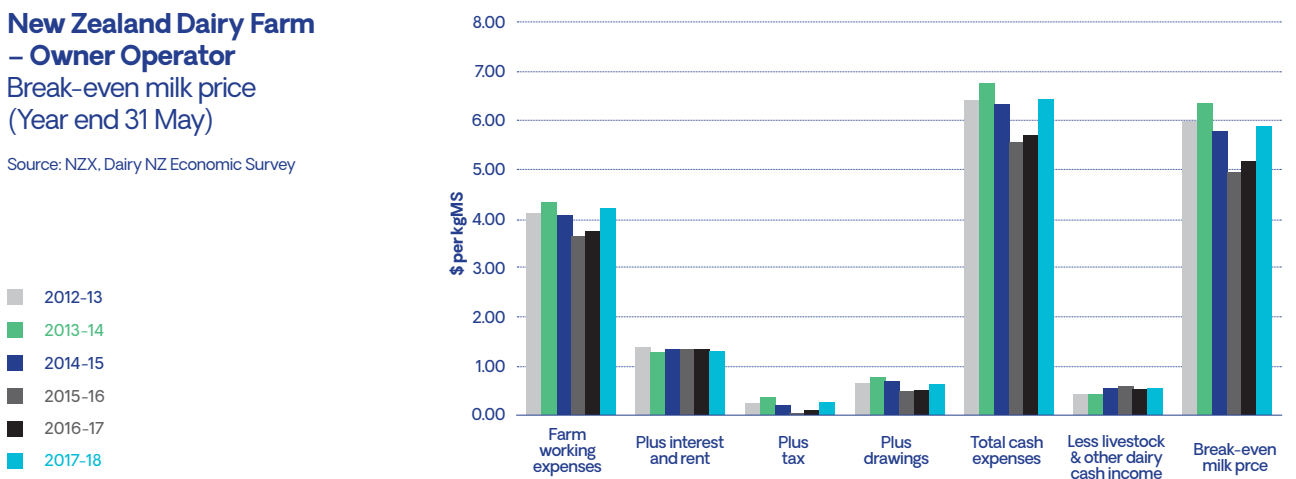


FIG. 32

New Zealand Dairy Farm – Owner Operator
Break-even milk price
(Year end 31 May)

Source: NZX, Dairy NZ Economic Survey



Environment



How will those rules impact the New Zealand dairy industry?

Let's estimate some high level costs. Government has published emission factor tables for methane production per dairy cow which estimates an annual average figure of 84.28kg for dairy cattle. If we convert this to a carbon dioxide equivalent by multiplying it by a standard coefficient of 25, we get about 2.1 tonne of carbon dioxide per cow per year.

Based on the average dairy herd¹ in New Zealand and the cost of carbon at a price of \$25/t, we arrive at an average cost of around \$23,000 per farm, per year. Farm working expenses currently make up around 65% of the break-even milk price. Adding carbon to farm working expenses would lift this to around 66% or an increase in working expenditure of 14 cents per kilogram of milk solids².

If we use DairyNZ's estimate that the break-even milk price for New Zealand dairy farms, on average for 2017-18, was \$5.88/kgMS, the additional cost of GHG bumps the break-even price up to more than \$6.00/kgMS. (See Fig. 32).

Reflecting on the 2018-19 season, reported farm-gate milk prices have been sitting around \$6.50/kgMS. When we consider that 35% of New Zealand's dairy debt is tied up in farms that require a break-even price, before

the inclusion of GHG, of \$6.20/kgMS, the addition of GHG emissions³ using our conservative estimates tightens up margins even further.

What does the future look like?

Accountability for GHGs on-farm will increase the cost of doing business for New Zealand dairy farmers, but it will also provide them the opportunity to maintain market access, and to promote New Zealand dairy products as being carbon neutral.

The New Zealand dairy industry has finished its growth phase and can be considered as having plateaued. However, two things are likely to support the notion that dairy is not going anywhere, anytime soon: land-use alternatives and investment.

Unless market price signals provide an economically viable alternative to dairy farming, it is not likely that we are going to see a shift away from this as a land use. As an investment, the average dairy farm has nearly \$4 million of term liabilities, with the value of land, buildings and livestock tied up in each business being around \$6.6 million. This is a significant investment in livestock and infrastructure that is not easily exited. Unless we encounter significant and ongoing price shocks, we see the industry remaining stable over the next five years.

FURTHERMORE, THE AVERAGE DAIRY FARM HAS NEARLY \$4 MILLION OF TERM LIABILITIES, WITH THE VALUE OF LAND, BUILDINGS AND LIVESTOCK TIED UP IN EACH BUSINESS BEING AROUND \$6.6 MILLION. THIS IS A SIGNIFICANT INVESTMENT IN LIVESTOCK AND INFRASTRUCTURE THAT IS NOT EASILY EXITED OUT OF.

1. 150 hectares, carrying 430 milking cows at peak milk production (DairyNZ)

2. Average dairy farm produced around 161,567kgMS in 2017-18 (DairyNZ)

3. Which only consider methane emissions, which make up only 71% of agricultural emissions



NEW ZEALAND

has a footprint of approximately:

0.8KG OF CO₂E/KG

of fat-&-protein-corrected milk using comprehensive assessment of cradle-to-farm gate carbon footprints

(Chotang 2016 & 2017).

UNITED STATES

has a footprint of approximately:

1.23KG OF CO₂E/KG

of fat- and protein-corrected milk provide a comprehensive assessment of cradle-to-farm gate carbon footprints for US dairy systems

(Thoma et al. (2013b).

A large pan-NZ study has been completed looking at carbon footprint of dairy, a paper on this study will appear in the Journal Of Dairy Science in late 2019.

CASE STUDY



perfectdayfoods.com



What do you do if your mission is to be a vegan but you absolutely love dairy products? You use science to find a way to create high-quality animal-free dairy, and that is exactly what Ryan Pandya and Perumal Gandhi did when they created Perfect Day Foods.

We had the fantastic opportunity to talk with Ryan, one of the founders, to understand more about what was behind the start of Perfect Day and what the company envisages as the future for cellular milk.

CELLULAR MILK

What was your motivation to set up Perfect Day foods?

It was very much a mission-led motivation. In college our concerns about the impact of our diets on animal welfare and the environment grew. Although Perumal and I both grew up eating meat and dairy we decided to go vegetarian to reduce our impact on the planet. The transition to vegetarian was easy, we just ate more eggs and dairy to compensate for not eating meat. After further research we decided that eggs and dairy were contributors to the problem so we looked to give them up as well, however, this was incredibly difficult.

We weren't overly enthused with alternative-based dairy products as we felt they had no nutrition, tasted really bad and cost more money. We realised that if it was hard for us, then it would be extremely difficult for the vegan movement to globally scale to a point that it could remove the need for factory farming. If it was so hard for them - even though they were so incredibly mission-driven - then there was no way this movement could scale across the world with such substandard products. So, in short, it was the desire to not eat bad food. Because we both had scientific backgrounds we just started to think about what's so magical about dairy, and research showed us that milk protein is what gives milk its magic.

How did you discover a process for animal free milk?

The process is called fermentation and it has been used for the last 40 years with the first application in biotechnology when vegetarian cheese was made. The original method used an enzyme called rennet which came from the gut of a calf, which didn't make sense if you want to be vegetarian. So, we devised a method where we could ferment the milk protein by using the protein DNA sequence without having to use animals, making it completely vegan.

The texture is just like milk. It can be used to create any typical dairy products such as ice cream, cheese or dairy ingredient. It also has the same amino acid as is normally derived from an animal. We don't class what we have done as self-determined brilliance, but rather good luck. We walked in behind Impossible Foods and Beyond Meat etc. Timing has been a significant part of the success.

Has it been difficult to find investment?

No. We have raised more money than anyone else in the cellular space as we have been able to commercialise and scale faster than meat-based cellular products. We mostly have the same investors as Impossible Foods. Investment in Perfect Day Foods has reached US\$60 million and Perumal and I have invested a full five years of our lives to develop the product to this point. We have been approached by different governments, however, our current focus is the United States.



CASE STUDY

THE GREAT THING ABOUT CELLULAR MILK IS IT CAN FIT INTO ESTABLISHED ANIMAL DAIRY PATHWAYS, EXISTING DAIRY PLANTS CAN USE THE PRODUCT AS IT ACTS LIKE MILK. ALL YOU NEED IS A FERMENTATION TANK. IT ALSO GIVES THE COMPANY THE OPPORTUNITY TO SWITCH UP THE SUPPLY VOLUME IMMEDIATELY AS IT ONLY TAKES FIVE DAYS FROM START TO FINISH WHEREAS A BIOLOGICAL SYSTEMS TAKE 2.5 YEARS TO ADD SUPPLY.



What does success look like for Perfect Day as company in 10 years?

Sharing the technology across the world will define true success. In 2018, there were more animals on earth than ever before. The animal protein industry is growing - it's a gigantic industry. The only true way to have impact and disrupt this industry is to share the technology. We want to see rapid change and we want to engage the traditional dairy market to embrace our technology. It will take more time and more investment to get it to be able to create incredibly affordable products - it's not far away. At that point we want to share the IP as far and wide as possible to allow for scalability. It's too big for just one company to hold this. We would like to see all dairy companies use this as part of their product mix.

We partnered with ADM (Archer Daniels Midlands) who are looking at amino acids for animal feed companies and they helped us learn how to scale up our technology.

We recently worked with an animal dairy ice cream company and launched a limited edition cellular milk ice cream which was exactly like animal dairy ice cream. We are an ingredient company at heart. If you go into a supermarket and we are the only brand then we have failed in our personal mission. We want rapid adoption and the only way to do that is if everyone has access to the technology.

Short term, we will continue to refine the process. We will produce the protein ourselves, our name will be present for transparency and to grow the public's knowledge about the capability of this awesome product. It's the world's cleanest, purest milk protein you can buy and we want people to know about it. Longer term we want the IP everywhere and we are less likely to see Perfect Day as a brand on its own - we will partner with other brands. If we were a boring dairy ingredient, we would be okay with that.



What's your vision for the future?

That 80% of the US milk supply comes from fermentation and 20% come from very high quality family farms using regenerative grazing methods.

This technology will take the pressure off animal farming. The problem is not that animals are used to produce food, it's that there are too many and this technology will enable us to assist in scaling back the animal industry and feed a growing world population. We see both traditional animal dairy and cellular as complementing each other and both contributing to feeding 10 billion people.

Our investment in communication tools so everyday people can fully understand the science and the technology is important. The true innovation is explaining the technology in the right way to engage more adopters.

Our biggest problem is being able to make enough. The dairy industry is so massive that current production and incremental volume shift won't make a difference. To get to scale, we want to partner with as many companies as possible to rapidly scale up the volumes. We are mission led and want to personally change the world and be part of saving the planet.



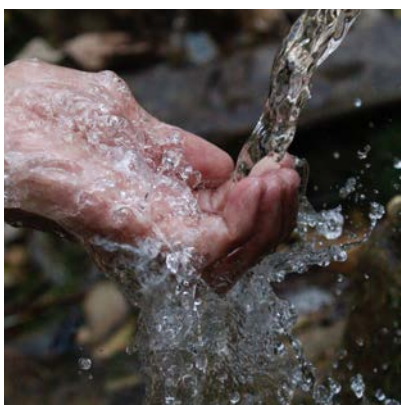
Ryan Pandya
CEO & Co-Founder



Perumal Gandhi
Co-Founder

Environment

Water



New Zealand is extremely lucky with our water supply. We have one of the world's largest renewable internal freshwater resources per capita, with water per capita of 72,510 (cubic meters). Although we work to be careful with water use we have to developed a laser focus on water quality.



Water in the New Zealand dairy industry has had a reasonably emotional history. There is lots of information on social media about farmers 'poisoning' water, followed by copious general media reports. Another side to this however is the bullying of the scientists who predicted the water quality issues. It's a very polarising topic where sentiment often overrides science.

In 2013 the New Zealand dairy industry united to sign up to the Freshwater Accord. This included dairy processors, industry groups and dairy producers who all committed to play their role in improving the health and wellbeing of New Zealand's fresh waterways. The main areas of focus are nutrient leaching management, minimising sediment and effluent control. The Accord was about engaging everyone to do their bit to improve the quality and manage the use of our essential fresh water.

Fast forward to 2019 and there has been significant progress on attending to reversing damage and preventing damage in the future. The New Zealand dairy industry has fenced over 24,000 kilometres of waterways, effluent systems have strong holding capacity and are strictly managed, stock crossing on farms have bridges and culverts to avoid stock getting into water, and riparian planting is a part of everyday farming. Many farmers have also restored wetlands on their property, retiring these parts of the farm to help protect land from flood damage by slowing or holding surface water and releasing it slowly over time. It's about working with nature not fighting it.



This year also brought with it a new proposal for a national regulation framework called the Essential Freshwater proposal, which looks at both the allocation of water and the regeneration of water health.

Looking further into the future it's expected that regional council implementation of the new National Policy Statement for Freshwater Management by 2025 will prevent intensification beyond what is sustainable for New Zealand's land and water. However, in the meantime, land-use changes and increases in farm inputs are to be tightly restricted. As part of this, the Essential Freshwater policy document states that resource consent will only be granted if the activity does not increase nitrogen, phosphorus, sediment or microbial pathogen discharges above the enterprise or property's 2013-18 baseline (the average for the period).

Based on this, one would assume that farmers would need to maintain a stocking rate close to, or lower than, their average over the 2013-18 timeframe. The New Zealand average stocking rate over the period from the 2012-13 season to the 2017-18 season was 2.85 cows per hectare.

**WE ARE ESTIMATING
A 2% DECLINE
IN TOTAL COW
NUMBERS EACH
SEASON UNTIL
2024-25, LARGELY
DUE TO EXPECTED
INCREASED
COMPLIANCE TO
MEET ENVIRONMENT
REGULATIONS.**

By 2025, this will drop the average stocking rate to 2.78 cows per hectare. We estimate total cow numbers to fall to 4.5 million head by 2024-25.

There are proven methods however on the management of water from progressive farmers. In some regions where environmental pressure is too much we are likely to see a transition of dairy farmers to produce more than just milk and diversifying what they grow.

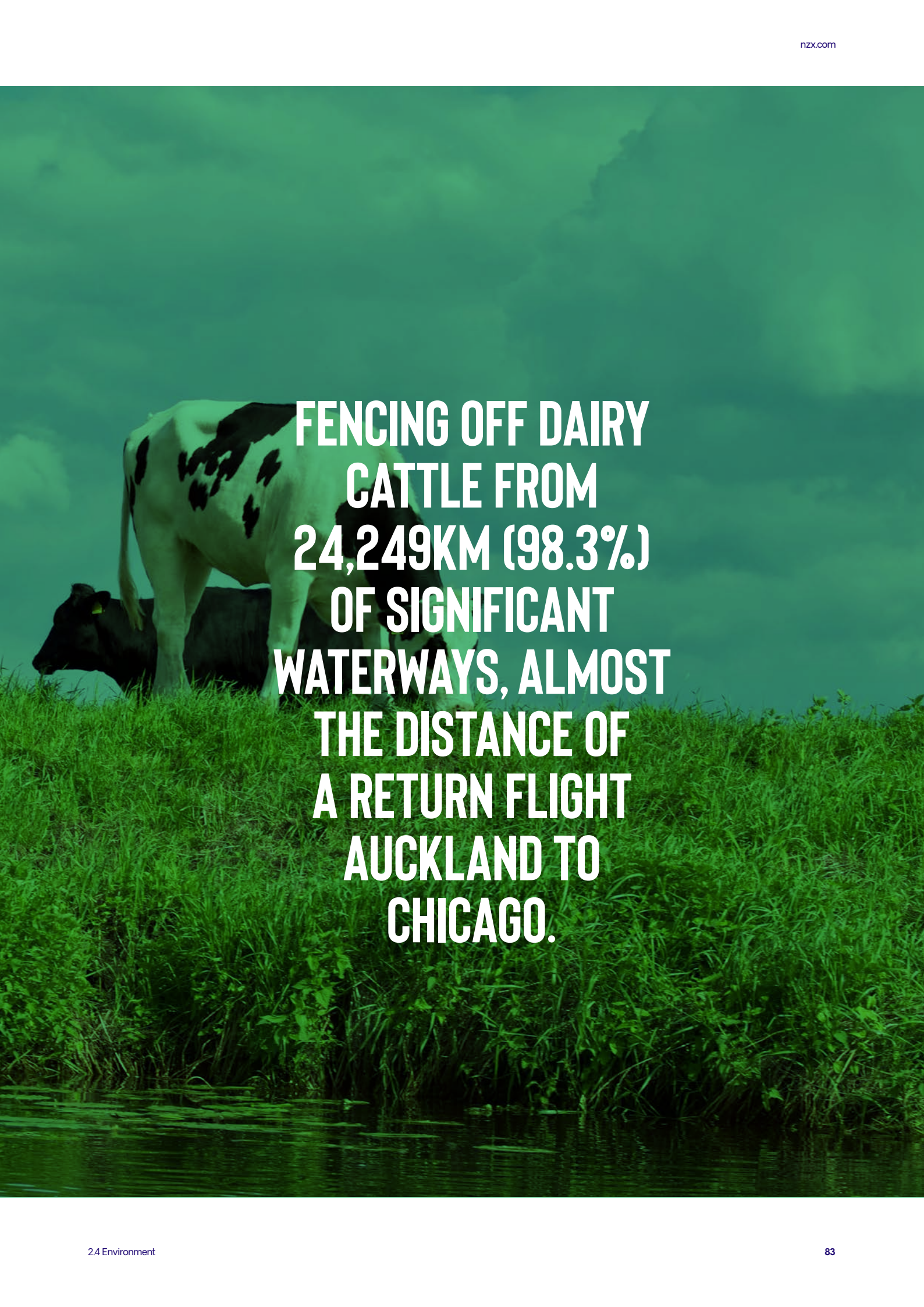




98%

**OF ELIGIBLE
WATERWAYS HAVE
BEEN FENCED TO
EXCLUDE CATTLE**

Source: Water Accord, DairyNZ



**FENCING OFF DAIRY
CATTLE FROM
24,249KM (98.3%)
OF SIGNIFICANT
WATERWAYS, ALMOST
THE DISTANCE OF
A RETURN FLIGHT
AUCKLAND TO
CHICAGO.**

2.5



EXPERIENCE

Experience is the thread that weaves all of the consumer themes together.

Experience drives the connection and emotion and shifts a moment of consuming from memorable to meaningful. From New Zealand's perspective this is about developing a New Zealand cuisine culture, not only having people experience our produce in a beautiful natural setting but also experiencing how we produce by connecting with our farming process. As previously mentioned people have never cared so much or known so little about how their food is produced, this presents a fantastic opportunity for the New Zealand dairy industry to connect the consumer with a wonderful dairy production experience and ensure that our producers are connected with consumers to really understand the wide needs of the consumer. The Miraka case study in this section beautifully brings all consumer themes together.

CE



NURTURING OUR WORLD



Māori are the indigenous people of New Zealand who have developed a culture based on synchronicity and connection with the natural environment. Māori have long been an active influence on New Zealand culture. Today, in a modern context, they are using their traditional cultural values to guide their own business and, ultimately, influence the dairy businesses of New Zealand.



Miraka is Māori

Miraka is an example of an indigenous business that New Zealand dairy businesses sit up and take notice of.

Miraka is the first Māori-owned and managed dairy factory in New Zealand. Situated at Mokai, 30km northwest of Taupō, Miraka is the result of Māori land owners who stepped into the manufacture and marketing of their own products to the world.

As an indigenous enterprise, Miraka has an inter-generational view of business including a 100-year view on success, relationships, growth, and profitability. Its vision is to “Nurture our world” in a way that cares for people and planet.

Kaitiakitanga (inter-relatedness of people and the environment) is a core ancestral value of Miraka and drives behaviour in the factory and across its farm supply base. *Tikanga* (graceful and enduring natural balance) is another inherited value. Together these values light the path for the current and future growth of the company.

Miraka wishes to act as a catalyst for vision, leadership, and relationship-building at community, local, national, and international levels.

Whole milk powder production began in 2011 with the addition of a UHT plant in 2014. The Taupō Pure brand was created in 2017 as a platform for direct customer sales.

Local farms supply 1.4M litres of milk a day from 70,000 cows, over a combined land area of 27,000 hectares. Miraka currently produces 60 million litres of UHT milk and 35,000 tonnes of milk powder annually.



CASE STUDY



MIRAKA UNDERSTANDS THE DEEP CONNECTION BETWEEN PEOPLE AND THE NATURAL WORLD. IT TAKES ITS ROLE AS KAITIAKI SERIOUSLY — THIS IS REFLECTED BOTH WITHIN ITS ORGANISATION AND IN ITS BUSINESS RELATIONSHIPS.

Miraka is Connection

Miraka was the first dairy factory internationally to use electricity and heat energy from renewable geothermal sources. It directs its organic waste to a worm farm to produce compost and uses its treated wastewater to irrigate adjacent farmland. Auditing waste streams, exploring alternative technologies, utilising re-useable/re-cycleable materials and a culture of continuous improvement all provide an important foundation for a resilient low-emissions, no-waste future.

Future ISO 14001 accreditation will assist Miraka to structure its environmental actions into an internationally recognised management framework.

Te Ara Miraka (the Miraka way) - its farming excellence programme - was introduced in 2015. To supply milk to Miraka, farmers must participate in Te Ara Miraka.

The programme aims to produce first-class milk with the lowest environmental impact and greatest farming efficiencies. Effluent and nutrient management, cow reproduction, in-calf rates, and milk production standards are audited annually. Farms meeting these standards gain an additional milk price premium.

The programme is a long-term commitment to provide Miraka farmers with the ability to care for the land, achieve profitability, produce quality milk, and build stronger communities. All waterways are stock fenced, dairy shed water is 100% free of E Coli and sediment, and all farms have Farm Environment Plans. Over time, Miraka expects to extend its influence beyond its own circle of production. There is much scope for change and better integration between milk production, environmental regeneration, and community revitalisation. Miraka see this as a step-by-step, conversion-by-conversation process on-farm, within community, and across industry.



Miraka is More

As an indigenous business, Miraka brings an additional quality to its business. It thinks about the world and its place upon it differently. Planning and thinking is always with an eye on the coming 100 years. As a values-based business, finding alignment within the organisation and across its external business relationships is seen as key to its success.

As a small company, Miraka wants to take on some big challenges. Saving the Planet is a tough order for a small dairy company and Miraka is always on the look-out for like-minded and like-spirited people and organisations. In doing so it seeks to create relationships that are not just transactional, but transformational. Building the right relationships will help it grow, learn, and collectively, shape the world and its future.

Miraka is an indigenous dairy company 10-years new to the global market, driven by a 100-year focus on the future and supported by 1,000 years of wisdom and tradition.

Mahi (work) means more at Miraka – the Māori culture and traditions of the organisation are a real point of difference. Attend one of its hui (meetings) as a guest and you'll soon feel part of the whānau (family).

As tangata whenua (people of the earth), Miraka wants to take actions and create ideas that are life-affirming and environmentally sound.



Conclusion

What's next for dairy?

No one can ever really predict the future although we like to think we can. In a world full of uncertainty there is great challenge but also unlimited opportunity for those with the courage to seek it. The world population continues to grow so the requirement for nutrition will continue to grow with that. Although we see the emergence of protein alternatives, they provide similar attributes but are currently unable to match the nutritional quality of natural animal proteins. Here are some areas we see the most change in the next five years.

An increase in alternative milking animals: We are likely to see an increase in alternative milking animal production in both goat and sheep in New Zealand. As outlined in the Spring Sheep case study they have been strategically supporting farmer conversions however they are in no rush to ramp up supply. The key to the success of this however will come from focusing on demand and having appropriate processing investment that doesn't over capitalise to the point that it becomes just another commodity product.

Greater focus on selling the process of production: New Zealand food producers are proud but also very humble so we have not been as successful at explaining the value of our production processes. We tend to over sell what doesn't matter while underselling what really does.

As consumers spend more time caring about how food is made we will need to spend more time explaining our philosophy of how we produce it.

We have a wonderful opportunity to promote the nutrition, our preservation of nature and our desire as a holistic industry to have an intergenerational mind-set.

Intergenerational mind-set: Intergenerational investment goes far beyond the desire to pass the farm on to the kids, it's really about investing today in things you will never see the benefit of yourself. Not just at an individual business level but as the holistic food and fibre industry. This will include those who have a passion for guardianship of the land being attracted into this sector.





Cohabitation of animal and non-animal proteins: With a mass of circulating reports calling for the end of animal protein and the rise of fermented milk you might start to think that this is the wave of the future. It's certainly a part of the dairying future but in a complementary way. Scaling these products is difficult. It's estimated it would require 1 trillion USD of stainless steel to scale up to only 10% of global milk consumption. Most reports appear to be coming from sources that are trying to attract funding for their fermentation techniques. This alerts the cynic in us – is this about talking their own book? You definitely shouldn't ignore this technology. Keep one eye on it but read between the lines of any reports. The technology will grow and improve but we see space for both to co-exist. Fermentation products will shift into the commodity space while the demand for natural animal nutrition and high value products will be met by traditional animal proteins.

Finding the Intersection of Economics and Environment

We should never compromise environment just to make cash; however fundamentally to survive we need a healthy financial environment. Life costs money. Whether it be funded by the private or public sector the wheels of commerce need to be spinning. This is where premium food production comes into play – producing for quality. We produce to regenerate the land and that attracts a premium consumer, with focus on getting paid more not producing more. This will mean a realignment of production. We may have to produce something different in some areas to ensure we can generate an appropriate level of income and reduce the impact on the environment. This will need to be transitional to ensure that communities are not economically compromised long term.



THE KEY FOR THE FUTURE, ESPECIALLY FOR A SMALL PRODUCING NATION LIKE NZ, IS BEING CONSUMER LED PRODUCERS. YOU EITHER CHOOSE TO ADAPT TO MEET THE DEMANDS OF THE CONSUMER OR YOU CHOOSE TO STAY THE SAME AND RISK IRRELEVANCE. IF YOU HATE CHANGE YOU WILL MOST LIKELY HATE IRRELEVANCE EVEN MORE.

NZX Dairy Analysts

What we do



Deliver relevant and timely data and information to help with decision making



Provide analysis, insight and foresight on domestic and global dairy markets



Shine a light on signals of change across the dairy value chain domestically and globally



Use our expert connections, analysis and intelligence from the New Zealand dairy industry to enhance your decision making

Services

Our independent and timely analysis provides customers with valuable insight into local and global market trends.

Our team have a reputation for delivering high quality, credible content in easy to read reports and email updates.

Data is collected directly from our international network of industry participants and NZX. We then draw on our extensive experience in this sector to deliver trusted and reliable analysis.

We know data and analysis can be time consuming, so our services are designed to be easy to digest, but comprehensive. We want to leave you feeling more informed.

Services available

- Regular reports including, Dairy Trade Statistics, Global Dairy Snapshot, Dairy Insight and Grain & Feed Insight
- One-on-one meetings with our analysts to gain insight on specific area of interest
- Specialist bespoke reporting

Further reading



Monthly Dairy

This is the dairy report the industry relies on and is our most widely read report.



Global Dairy Snapshot

This report is designed for dairy professionals who are actively involved in trading dairy commodities.



Dairy Pasture Growth Index

This measures potential pasture growth based on three factors: rainfall, temperature and light.



Dairy Insight


Dairy Insight is a weekly report designed to provide New Zealand farmers with the latest market insights.

More available online, to find out more, or to sign up today, visit:

www.nzx.com/products/nzx-dairy-data

Wellington: 11 Cable Street, Te Aro, Wellington

Auckland: Level 7, Zurich House, 21 Queen Street, Auckland



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